# PowerWatch©

## Reference Guide

2007 ACR Systems Inc.

## PowerWatch©

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## WELCOME

Congratulations on your purchase of a PowerWatch data logger. We are confident that you will find it to be a most valuable and useful tool for your data collection applications.

This Reference Guide is designed to be used hand-in-hand with the PowerWatch software and frequently refers to PowerWatch conventions and procedures. To get the most from your logger, please take time to familiarize yourself with the PowerWatch software and its Reference Guide.

For important information on how all PowerWatch data loggers work and how to use them, read the About PowerWatch chapter. It will give you an overview of how the loggers work and how to configure them for your application. Next, read the chapter that deals specifically with the type of PowerWatch logger you have.

# SECTION 1 ACR Systems Inc.

## 1.1 About ACR Systems Inc.

# About ACR Systems Inc.

**ACR Systems** offers a complete line of compact Data Loggers to measure and record temperature, relative humidity, electric current, pressure, process signals, pulse frequency, power quality and more. **ACR** Data Loggers have flown with airline pilots, raced with Indy drivers, driven with truckers and have even been into outer space. **ACR** Loggers sit on top, under and in buildings; they operate in tropical and sub-zero temperatures, in and out of water and in just about any place imaginable.

**ACR Systems** continues to be customer-driven, using its research and development expertise to accept challenges others prefer to avoid. As a result, **ACR** remains on the leading edge of technological advancements with simple, cost efficient and state-of-the-art, technology-based products. Each **ACR** product will further the tradition of maximizing safety, increasing efficiency and solving problems overdue for solution. **ACR** products continue to be refined and improved to provide customers of every size and need with innovative ways to do the job better, faster and more efficiently.

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Canada

Our customer support representatives are available during normal business hours, 6:30am - 4:30pm Pacific Standard Time.

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## 1.2 ACR and the World Wide Web

# ACR and the World Wide Web

Visit the ACR Web Page by clicking here or using your installed links in the ACR default file folder.

From here, it's easy to search products, learn what's new, order a catalog, or even see when our tradeshows will take us to your area.

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## SECTION 2 The PowerWatch Voltage Disturbance Recorder

# PowerWatch Voltage Disturbance Recorder

### Reference Guide

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## 2.1 About PowerWatch

# About PowerWatch

Thank you for choosing another world-class Event Logger from ACR Systems Inc. The **PowerWatch** Voltage Disturbance Recorder (**VDR**) is an easy-to-use, low-cost power quality analysis tool that troubleshoots power line disturbances.

**The PowerWatch Voltage Disturbance Recorder**:

- The PowerWatch VDR
- PowerWatch VDR Features
- Safety Precautions
- Plugging in a PowerWatch VDR
- Electrical Immunity
- Safety Inspection
- Battery Care
- Maintenance
- Product Service
- Approvals
- VDR Specifications

### The PowerWatch VDR

PowerWatch VDR Features
The PowerWatch VDR records surges, sags, impulses, outages and frequency variations. It is self powered and easy to use - parameters can be set by a few easy keystrokes from your PC.
The VDR can retain 4,000 events. The existence of recorded events can be indicated by the VDR's flashing light.
Communication between a PC and the VDR is carried via the Lite-Link interface cable. By using this optical data transfer, the PC remains electrically isolated.

### Safety Precautions

The VDR is designed and certified to work only on single-phase systems. Attempting to modify the VDR or operating it improperly may cause circuit damage which can ultimately result in property damage, personal injury, or death.

### Plugging in a PowerWatch VDR

The VDR is designed to plug into a standard convenience outlet. As a safety precaution, the unit should be in a place where it can be easily unplugged. This will also make it accessible for data retrieval. The VDR does not use a protective earth connection since there are no exposed metal parts. The earth conductor is used to measure neutral to ground (N-G) events. The ground prong may be electrically unconnected (as long as it is not exposed). The

VDR does not normally need any special ventilation, however, its ambient temperature should not be allowed to rise above the operating limit.

### Electrical Immunity

The VDR's internal circuitry is solid-state with built-in EMI and RFI protection to ensure reliable readings.

### Safety Inspection

We recommend that you inspect the VDR periodically for visible damage. To ensure that it operates safely, inspect for missing labels, cracks in the case, or bent blades and/or broken leads.

### Battery Care

The VDR contains a lithium battery that will, under normal circumstances, allow the VDR to operate for 10 years. Exposing the VDR to extreme temperatures for extended periods of time may reduce battery life by as much as 50%. The VDR is designed for INDOOR USE. It should not be exposed to direct sunlight.
To extend battery life, keep the VDR plugged into a standard convenience outlet (even when not in use).

WARNING: BATTERY POSES FIRE, EXPLOSION AND SEVERE BURN HAZARD. DO NOT RECHARGE, DISASSEMBLE, HEAT ABOVE 100°C (212°F), INCINERATE, OR EXPOSE CONTENTS TO WATER

### Maintenance

The PowerWatch VDR is a maintenance-free product. However, it is recommended that it be kept clean to allow for easy visual inspections. To clean the VDR, unplug it from the outlet and wipe it with a dry, clean cloth.

### Product Service

The PowerWatch VDR has no user-serviceable parts inside. The fuse inside the VDR is NOT OPERATOR-REPLACEABLE. Opening the case, or attempting to do so, will void the warranty and safety certification. If you require service, please contact your local dealer or factory representative.

### Approvals

- Safety:

This device is safety approved in North America by CSA and CSA (NRTL/C)

for measurements on 150V CAT III, Pollution Degree 2, double insulation, per:

CSA C22.2 No. 61010-1-04
UL STD No. 61010-1 (2nd Edition)

International models evaluated by CSA under CB Test Certificate are suitable for measurement on 300V CAT III.

- Environmental:
  MIL-T-28800E, Type III, Class 3

- EMC
  FCC rules part 15.
  89/336/EEC
  Emission: EN50081.1
  Immunity: EN50082.2
  (IEC1000-4-2, -3, -4, -5)

**VDR Specifications**

| | |
|---|---|
| Model number**:** | **PWV-001** |
| Nominal Supply: | 100/110V |
| Operating Range: | 70 to 140V |
| Frequency: | 50/60Hz |
| Power: | 2W |
| | |
| Model number: | **PWV-002** |
| Nominal Supply: | 220/240V |
| Operating Range: | 140 to 270V |
| Frequency: | 50/60Hz |
| Power: | 3W |
| | |
| Model number: | **PWV-001 & PWV-002** |
| Memory Size: | 32KB, 4000 events |
| Storage Method: | First-in First-out, or<br>Fill-then-stop |
| Sampling Method: | Continuous<br>(half cycle integrated) |
| Alarm Type: | Optical; red LED |
| Size: | 85mm x 68mm x 35mm<br>(3.35 in x 2.65 in x 1.35 in) |
| Weight: | 120g (4 oz) |
| Case Material: | Noryl |
| Operating Limits: | Temperature 5 to 40°C (41 to 104°F)<br>Humidity maximum 80% RH for temperatures up to 31°C decreasing linearly to 50% RH at 40°C<br>Altitude 2000m |
| Battery: | 3.6V Lithium |
| Battery Life: | 10 years projected |
| Fuse: | 1/16A Fast-blow<br>(NON-REPLACEABLE) |

Note: ACR reserves the right to change its specifications at any time, without notice.

## Surge, Sag & Outage Measurement

| | |
|---|---|
| Model number: | **PWV-001** |
| **Hot to Neutral** | |
| Range: | 0 to 200Vrms |
| Accuracy: | ±2Vrms* |
| Resolution: | 1Vrms |
| **Neutral to ground** | |
| Range: | 3 to 150Vrms |
| Accuracy: | ±2Vrms |
| Resolution: | 1Vrms |

| | |
|---|---|
| Model number: | **PWV-002** |
| **Hot to Neutral** | |
| Range: | 0 to 270Vrms |
| Accuracy: | ±4Vrms** |
| Resolution: | 2Vrms |
| **Neutral to ground** | |
| Range: | 3 to 150Vrms |
| Accuracy: | ±2Vrms |
| Resolution: | 1Vrms |

* sags less than 70V for >1 sec will be reported as øV

** sags less than 140V for >1 sec will be reported as øV

**Impulse Measurement**

| | |
|---|---|
| Model number: | **PWV-001 & PWV-002** |
| **Range** | |
| Hot to Neutral: | 100 to 2500Vpeak |
| Neutral to Ground: | 50 to 2500Vpeak |
| Accuracy: | ±10% of reading |
| Resolution: | 10V |
| Width Detection: | 1 µsec minimum |

**Phase Angle**

| | |
|---|---|
| Accuracy: | ±1° (20° to 180°, 200° to 360°) |
| Resolution: | 1° |

**Frequency Measurement**

| | |
|---|---|
| Range: | 45 to 65Hz |
| Accuracy: | ±0.1Hz (3 cycles minimum) |
| Resolution: | 0.1Hz |

**Time Measurement**

Events <1 second

Accuracy

| | |
|---|---|
| Hot to Neutral: | ±0.5 cycle* |

Neutral to Ground: ±1 cycle**

Resolution

Hot to Neutral: 0.5 cycle

Neutral to Ground: 1 cycle

* Outages are reported with 1/2 cycle resolution until the VDR goes into low power mode. A VDR will go into the low power mode after approximately one second of an outage condition. In low power mode, the resolution becomes 8 seconds.

* Surge and Sag and frequency events have 1/2 cycle resolution up to approximately 10 minutes after which the resolution becomes 8 seconds.

** Neutral to Ground surges have 1 cycle resolution up to approximately 10 minutes after which the resolution becomes 8 seconds.

Clock accuracy ±2 sec./day

Specifications subject to change without notice.

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### 2.1.1 VDR

# VDR

Voltage Disturbance Recorder

## 2.2 Hardware Warranty

# Hardware Warranty

Please note the follwing disclaimer when using ACR products:

ACR Systems Inc. ("ACR") warrants that its data loggers will perform substantially in accordance with the product documentation supplied with the data loggers (the "documentation") for a period of three years from the date of shipment from ACR. If you have acquired the data logger from an authorized ACR reseller, we will delay the commencement of the warranty until the date the data logger was shipped to you by the reseller, provided that within 90 days of the data logger being shipped to you by reseller, you or the reseller provide us with the serial number of the data logger, your name, and the date the data logger was shipped to you. During the warranty period, ACR shall repair or replace, at its option and at no additional charge to you, any data logger that fails to perform substantially in accordance with its documentation (a "defective data logger"). If you wish ACR repair the logger, you must contact ACR, obtain a return merchandise authorization ("RMA") number and ship the defective data logger to the designated ACR facility. ACR will not accept any product returned without an RMA number. You shall bear all costs of delivering the defective data logger to the ACR facility and ACR shall bear all costs of delivering the repaired or replacement data logger back to you. Replacement data loggers shall be covered by this warranty only for the remainder of the warranty period for the replaced data logger. In no event shall ACR be responsible for the repair or replacement of any data logger if ACR reasonably determines that a problem results from:

a. The use of the data logger in a manner or for an activity not contemplated by the documentation.

b. The use of the data logger in conjunction with software or hardware that has not been supplied or specifically authorized by ACR.

c. Abnormal environmental conditions.

d. Wiring, electrical or network problems.

e. Your willful or negligent acts.

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## 2.3 Software Disclaimer

# Software Disclaimer

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**ACR Systems Inc.,**
**Address: # 210-12960 84‴ Ave., Surrey B.C., Canada, V3W 1K7**
**Phone: 1-800-663-7845 (toll free) or 1-604-591-1128**
**Fax: 1-604-591-2252**
**E-mail:** enquiry@acrsystems.com
**Website:** www.acrsystems.com

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## SECTION 3 Installing PowerWatch Software

# Getting Started

Computer system requirements, the interface package contents, and installing the
ACR PowerWatch program.

### PowerWatch system requirements

ACR PowerWatch software requirements:
- IBM PC or 100% compatible, with Windows 3.1, 95, 98, NT
- At least one free serial port
- A pointing device (recommended)
- 2 MB hard drive space
- 4 MB RAM for Windows 3.1, 8MB RAM for Windows 95, 98, NT

Optional Equipment:
- A printer port with a printer supported by Microsoft Windows
- Modem (9600 bps minimum)

### PWI-100 Interface Package contents

The PWI communication package enables you to set up the VDR, download all the stored events and display the stored information. Each package contains:
- One 3.5" PowerWatch software diskette
- One LIC-101 Lite-Link interface cable
- One 9- to 25-pin adapter
- This reference guide

### Installing PowerWatch

1. Before installing the PowerWatch program, restart Windows.
2. For Windows 3.1, open Program Manager, select File from the menu bar and choose Run...
Windows 95, 98 and NT users select Start from the Taskbar on the desktop and choose Run...
3. In the Run dialog box that appears, type a:setup for drive A and press Enter (the Return key on some keyboards). If you are using drive B, type b:setup.
4. A Setup dialog box will appear asking if you want to continue installing PowerWatch on your hard drive.

The last dialog box will inform you that software installation is complete.

### Setting Time and Date

It is very important that your PC system's time and date are correct before

running the PowerWatch program. When retrieving data from the VDR the PowerWatch program uses the PC's internal clock for time and date reference.

- With Windows running, set the time from the Control Panel in Program Manager.
- Windows 95, 98, and NT users open the Control Panel from the Taskbar by choosing Start, Settings, and Control Panel.

Information about setting the time can be found in the Windows User's Guide.

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## SECTION 4 Menu Options

# ACR PowerWatch Main Menu Overview

- File Menu
- Edit Menu
- View Menu
- Communicate Menu
- Options Menu
- Window Menu
- Help Menu

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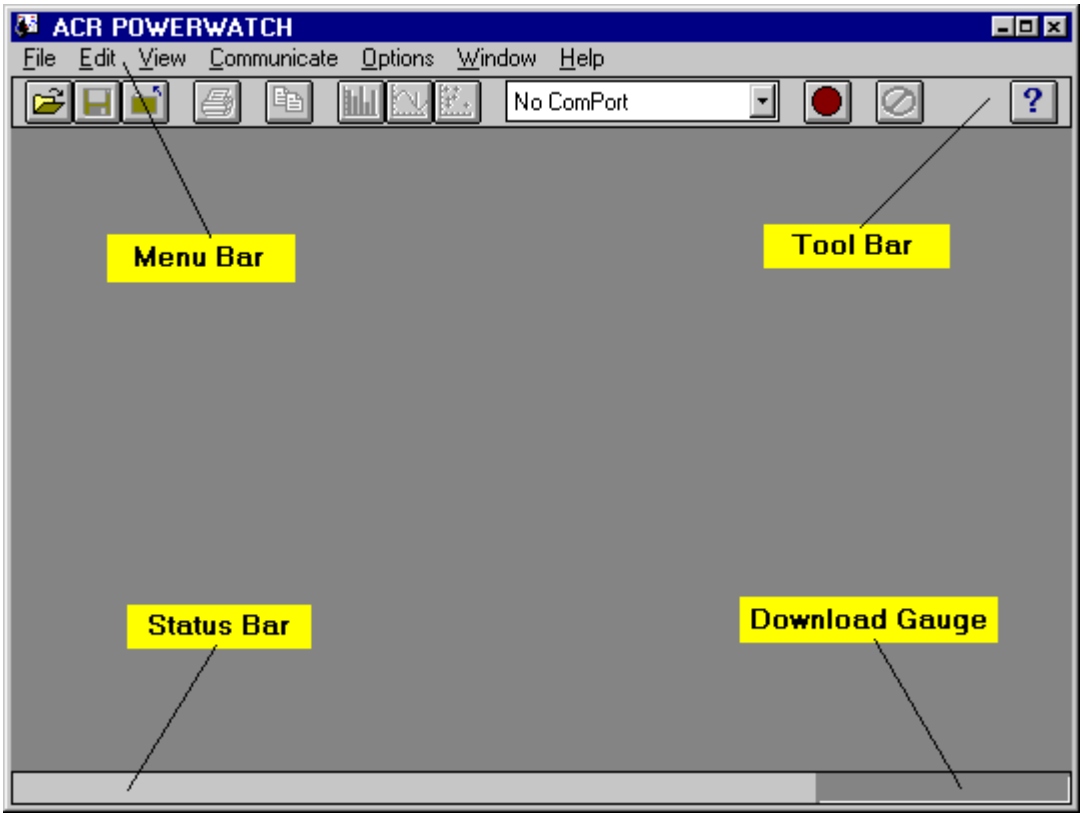
## 4.1 PowerWatch Main Window

# PowerWatch Main Window




At the top of this window is a menu bar listing various menu selections; below that is a toolbar; and at the bottom of the window is a status bar.

The Menu Bar consists of the following items:

File
Edit
View
Communicate
Options
WIndow
Help

The ToolBar buttons provide access to may of the menu functions. The buttons are (from left to right):

Open Site File
Save Active Window
Close Active Window
Print
Copy
View Quick Summary

View Single Impulse
View Event Distribution
Open COM Port
Toggle Scanning
Stop Backup
Help

The Status Bar displays messages indicating the current status of PowerWatch. At the far right is a backup gauge which displays percent completed when downloading data.

---

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**4.1.1 File Menu**

# File Menu

This menu contains the following items:

Open Site File...
Save
Save As...
Close
Print...
Setup Printer...
Exit

**Open Site File...**
This menu item opens a previously saved site file.

**Save**
This menu item saves the active window. If the window has a filename associated with it, it will be saved under that name. If a name is required, then a dialog box will appear to prompt for a filename (Modem parameters are saved to the PWV.INI file.)

**Save As...**
This menu item saves the active window as above but prompts for a filename. Site files are saved as PWV files or as text files (CSV, TXT or ASC). Graph files are saved as images (either BMP or WMF).

**Close**
This menu item closes the active window.

**Print...**
This menu item prints the active window. A print dialog box appears which allows print options.

**Setup Printer...**

This menu item sets up the printer. A printer dialog box appears which allows selection of printer, page orientation, and other printer options.

**Exit**
This menu item ends the program.

---

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**4.1.2 Edit Menu**

# Edit Menu

The Edit menu allows access to the following common editing functions:

Undo - undoes the last action. Only valid for text editing.
Cut - cuts selected text and stores it in the clipboard
Copy - copies selected text to the clipboard
Paste - pastes the contents of the clipboard to the active control

In addition, PowerWatch has the following additional functions:

Font ... - change the font of the current text
PhoneBook... - calls up the modem window to allow changes to the list of phone numbers.
Graph.. - calls up the Graph Control dialog box to edit the graph display.

---

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**4.1.3 View Menu**

# View Menu

This menu opens accessory windows.

**Quick Summary**
The Quick Summary displays a bar graph of the events stored in a VDR.

**Impulse**
The Impulse graph displays a single power cycle (or a flat line in the case of a Neutral to Ground event) on which is drawn a representation of an impulse event.

**Event Distribution**
The Event Distribution Graph plots the magnitude of an event against the duration on a logarithmic scale in order to determine the importance of the

data.

**Message Log**
The message log contains a list of the most recent messages displayed on the status bar.

---

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4.1.3.1 **Quick Summary**

# Quick Summary

Quick Summary displays the number of surge, sag, impulse, and frequency events as bars on a graph. Outages are included with sags.

The horizontal axis displays time; the vertical axis displays the number of events that occurred in each time period. In the Quick Summary above, the time periods are sorted by date.

Note that the thickness of a bar and its position in a time period is irrelevant; the bar only displays the number of events and the time period they occurred in.

If more detailed analysis is needed, it may be better to export the file to a spreadsheet or database for further manipulation.

A Quick Summary can be saved in either a bitmap(BMP) or metafile(WMF) format. In most cases, a metafile format is preferred since it is smaller, is easily scaled, and prints better. However, some applications (such as MS-PAINT) can only handle the BMP format.

To Edit the graph, right-click anywhere in the graph to open the Graph Control dialog box.

See also:
Printing events

---

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4.1.3.1.1 **Exporting Files**

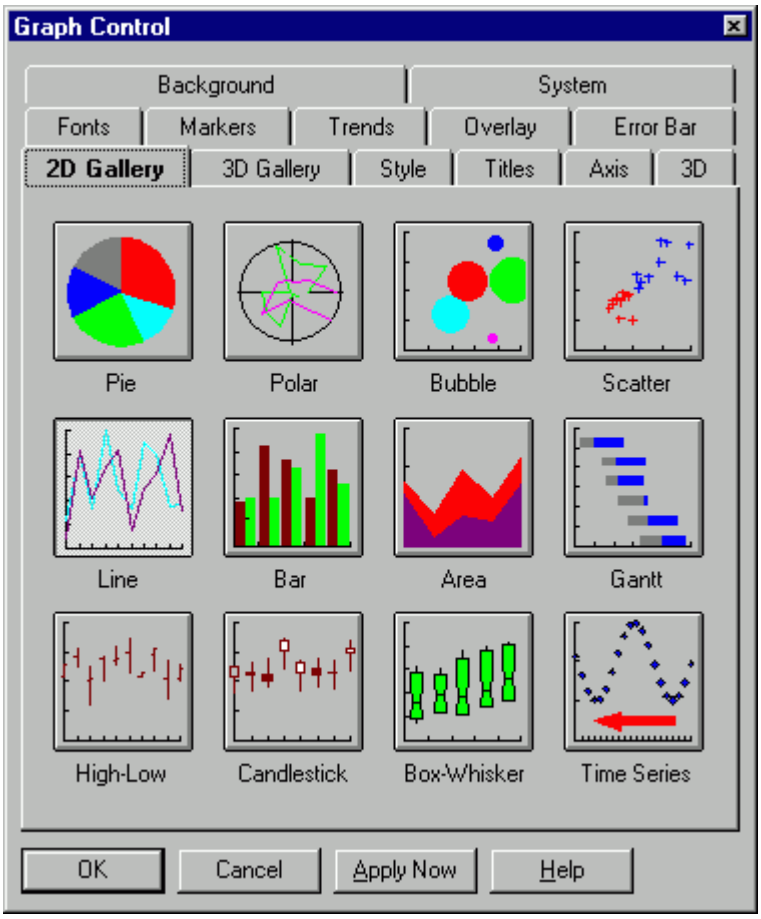
# Exporting Files

Data is typically saved in a binary file format (PWV) but can be exported to other applications as ASCII in tab separated format (ASC), comma separated format (CSV) or in plain text (TXT).

Graphs can be exported as bitmaps (BMP) or metafiles (WMF).

#### 4.1.3.1.2 Graph Control Dialog Box

# Graph Control Dialog Box



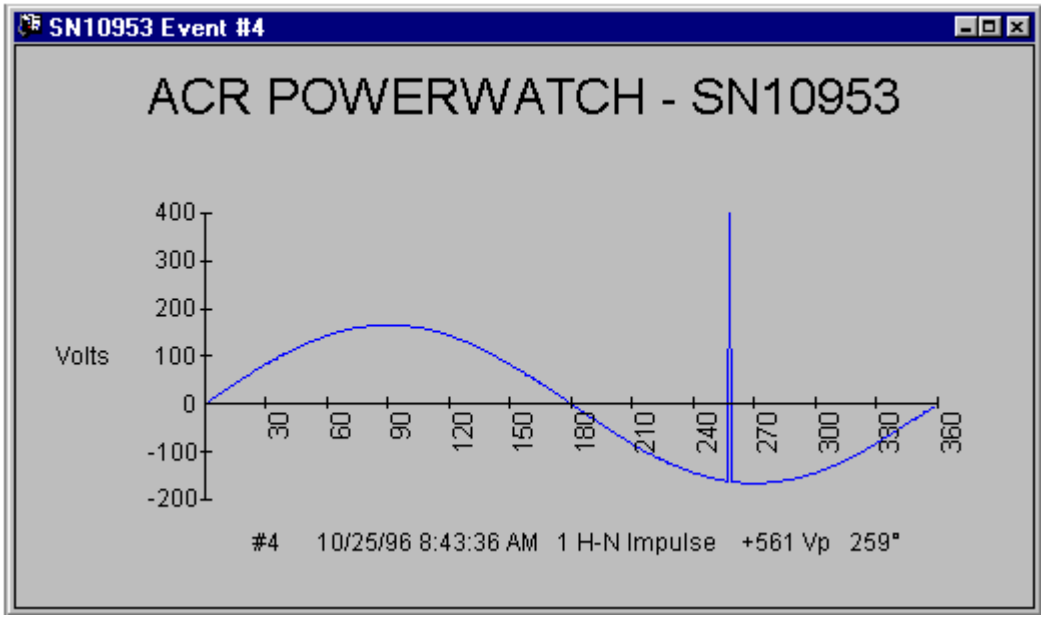

The Graph Control dialog box has a number of edit features that enable you to change the way a graph appears. These features include naming and placing titles, using 3D effects, and saving a graph in different formats.

Open this dialog box by right-clicking anywhere in a graph.

Click the dialog box's Help button for explanation of the various features.

#### 4.1.3.2 Single Impulse Graph

# Single Impulse Graph




A single impulse event between hot and neutral or neutral and ground can be displayed as a graph, enabling you to see if the impulse is causing zero crossings.

An impulse graph is produced using the amplitude, polarity/direction, and position (in degrees) of the event. The graphical representation is not intended to show the actual wave form nor does it show the duration of the impulse.

**Important** To graph an impulse you must choose an event that contains only *one* impulse; it is not possible to graph an event consisting of multiple impulses.

See also:
Impulse events
Printing events

---

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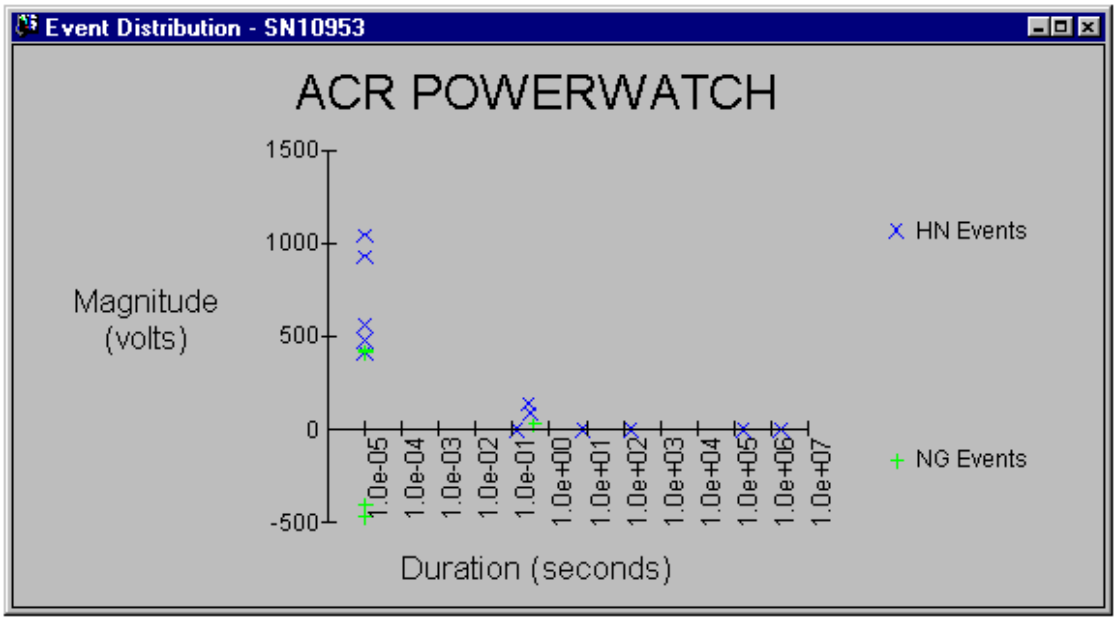
**4.1.3.3 Event Distribution Graph**

# Event Distribution Graph




The Event Distribution Graph plots the magnitude of the event against duration on a logarithmic scale in order to determine the importance of the data. For example, a single random event may not be as significant as a cluster of recurring events.

This information can be interpreted using the CBEMA Curve found in Appendix B, *Power Quality Issues*, in the PowerWatch Reference Guide.

Since the impulses have a duration that is unknown, they are represented as having a width of 10 microseconds.

---

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#### 4.1.3.4 Message Log

# Message Log

The message log is a record of the last 800 items to have appeared on the status bar.

These messages can be saved to disk or printed by using the appropriate menu item or tool bar button.

---

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### 4.1.4 Communicate Menu

# Communicate Menu

The Communicate menu has the following menu items:

Open COM1:
Open COM2:
Open COM3:
Open COM4:
Modem Setup...
Scan

**Open COM#**
This menu item opens the numbered COM Port(s) available to the system.

If a modem has been detected, it will be listed on the menu (for example, Open COM1: Modem).

When PowerWatch is run, it first attempts to find all available COM ports and list them on the Communicate menu. Ports that it cannot find either don't exist or are in use. For example, if your computer has two COM ports (1, 2) and if COM 1 is being used by the mouse, and COM 2 is unused, then only COM 2 will appear on the Communicate menu.

Clicking on an unchecked port will cause PowerWatch to try to open that port; it will also close the currently open port. Clicking on a checked (open) port will close that port. Only one port may be open at a given instant.

**Modem Setup...**
This menu item displays the Modem window. It allows you to add, delete or edit phone book entries or modem setup strings.

**Scan**
This menu item indicates whether or not the program is scanning for new PowerWatch loggers. Checked means that scanning is ON. Clicking on this item will toggle the setting.

---

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### 4.1.4.1 Modem

# Modem

An interface between a computer or other terminal and a phone line. Used to communicate with PowerWatch VDRs remotely.

### 4.1.5 Options Menu

# Options Menu

This menu consists of the following items:

**Show Graph Setup** - When checked, the Graph Setup Dialog box is displayed before a graph is drawn.

**Show ToolBar** - When checked, the ToolBar is displayed

**Show ToolTips** - When checked, ToolTips are shown over most active buttons and fields.

**Calibration** - Use this function to adjust the calibration settings of the logger.

---

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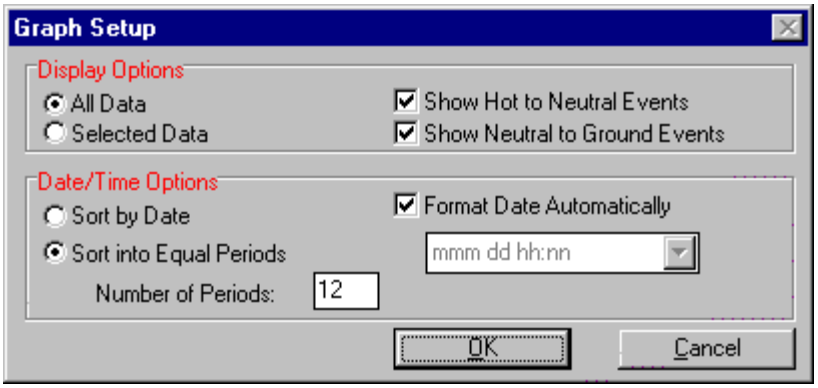
### 4.1.5.1 Graph Setup/Viewing Options

# Graph Setup/Viewing Options




The Graph Setup dialog box gives you a number of viewing options:

**All Data or Selected Data** - To display all relavent events, click **All Data**. To display a block of events from the Events tab, select those events by dragging the pointer through them to highlight them.

**Show Hot to Neutral Events** - Check this box to display all hot to neutral events.

**Show Neutral to Ground Events** - Check this box to display all neutral to ground events.

**Sort by Date** or **Sort into Equal Periods** - If you want the horizontal axis divided on a daily basis, click **Sort by Date**. If you want to divide the horizontal axis into equal periods, click **Sort into Equal Periods** and type the number of divisions you want to display.

**Format Date Automatically** - The program will automatically select a format for displaying the date labels on the X-axis.

**Format List** - Auto Format is not checked, then the program will use the format method displayed in the list box.

| | |
|---|---|
| mmm dd hh:nn | Displays Nov 24 15:36 |
| mm/dd/yy | Date format 11/24/95 |
| hh:nn:ss | Time format 15:36:28 |
| ddddd | Displays 11/24/95 |
| c | Windows default format |

---

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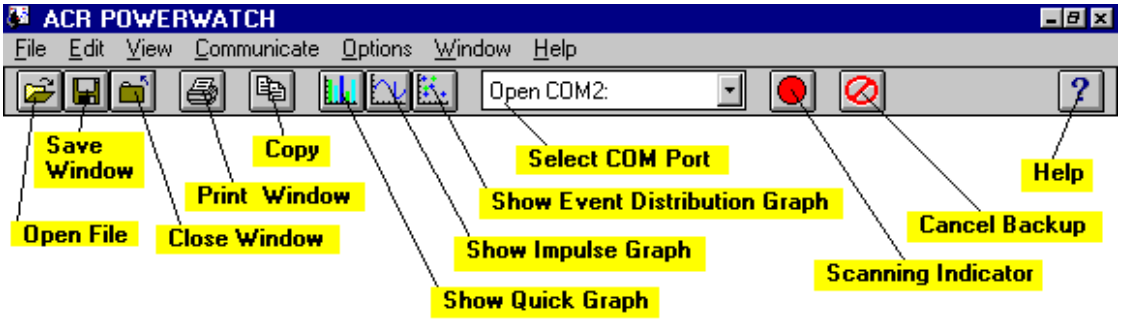
**4.1.5.2 ToolBar**

# ToolBar




The ToolBar is a quick way to access some of the more common functions of the PowerWatch program. All the buttons on the Toolbar have menu equivalents on the menu bar. If you do not wish to display the toolbar (perhaps due to space restrictions), you can disable this feature in the Options menu.

**Buttons**

- Displays a dialog box to open a PWV Site File
- Displays a dialog box to save the active window.
- Closes the active window
- Prints the active window
- Copies the active window to the clipboard

- Displays a Quick Summary summarizing the events
- Displays a graphical representation of an impulse event
- Displays an Event Distribution Graph
- Selects the current serial port
- Turns scanning on (blinking) or off (not blinking)
- Cancels the current downloading operation
- Displays this helpfile

For more information on each button, see its equivalent in the menu bar.

---

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#### 4.1.5.3 ToolTips

# ToolTips

A small descriptive tag that appears when the mouse pointer passes over a button or text box. This tag contains help on using the button or text box.

---

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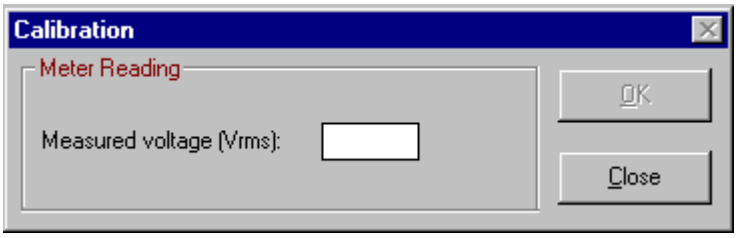
#### 4.1.5.4 Calibration Utility

# Calibration Utility

Use this function to adjust the calibration settings of the logger. Before adjusting the logger's calibration, you will need a reliable AC power source and a calibrated multimeter to verify the voltage of the AC source.

Use the Calibration window to adjust the calibration settings of the PowerWatch. An illustration of the calibration window is displayed below:

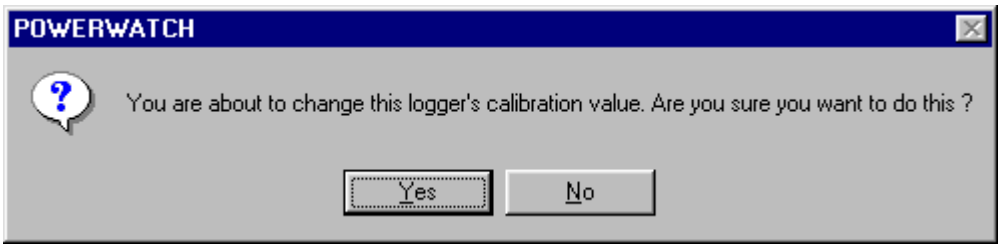



Enter the voltage displayed by the multimeter into the Measured Voltage text box.

The application enables the OK button once the following conditions are met:
* The desired voltage is within a specific range of the current line voltage

-- ±15 volts for 120V models and ±16 volts for 240V models. Perform the calibration sequence multiple times if a larger adjustment is required.
* For 240V models, enter even voltages only.

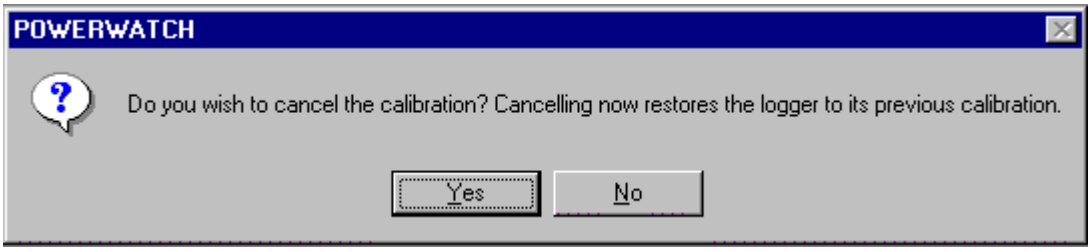
Click OK to accept the value. The application then displays a confirmation message, as illustrated below:




Click the Yes button to start the calibration process. The application displays a timer in the calibration window to indicate progress.

Click the No button to cancel the calibration process. No changes are made to the PowerWatch logger.

Click the CANCEL button at anytime to stop the calibration. The application then displays the following dialog:


POWERWATCH
Do you wish to cancel the calibration? Cancelling now restores the logger to its previous calibration.
Yes
No

Cancelling the calibration process restores the previous calibration settings of the PowerWatch.

---

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**4.1.6 Window Menu**

# Window Menu

The Window menu makes available a standard set of Windows commands to aid in placement of the "child" windows (sites and graphs) of the main program.

**Cascade** - Arranges the windows in descending order.

**Tile Horizontally** - Arranges the windows side by side

**Tile Vertically** - Arranges the windows on top of each other

**Arrange Icons** - Automatically arranges all icons (minimized forms) along the bottom of the main program window

There will also be a listing of all child windows. Selecting a name will set focus to the respective window.

---

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### 4.1.7 Help Menu

# Help Menu

This menu contains several help items.

**About**...
Displays the About window which contains software version information.

**Search**...
Displays the search dialog box to find entries in the Help File.

**Overview**...
Opens the Help File at the main topic " PowerWatch Overview"

In addition, pressing F1 at anytime will bring up context sensitive help.

---

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### 4.1.7.1 About Window

# About Window

The main purpose of the About window is to display version and copyright information. In addition, it shows current memory available. The Last Modified date indicates the date and time this particular program was compiled.

---

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# SECTION 5 PowerWatch Operating Overview

## Overview

The PowerWatch software program enables the set up of a PowerWatch Voltage Disturbance Recorder to detect, measure and record variations in power quality.

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## 5.1 PowerWatch Setup

# Setting Up a ACR PowerWatch

- Connecting the Lite-Link Interface Cable
- Starting the Program
  - Selecting a COM port
  - Opening the Site Report Window
- Setting Thresholds on the Status Bar
- Viewing the Default Threshold Settings
- Choosing and Saving New Default Settings
- Choosing Operating Options
- Describing the Site
- Viewing the VDR's Realtime Readings
- Viewing Logger Information
- Sending the Setup to the VDR
- Retrieving events from a VDR
- Saving Events

See also:
Setting up a PowerWatch VDR

---

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## 5.1.1 Connecting the Lite-Link Interface Cable

# Connecting the Lite-Link Interface Cable

The PowerWatch program communicates with a VDR via the Lite-Link interface cable.

- Plug this cable into an available 9-pin serial port in your computer.

If the computer has only a 25-pin serial port, plug the 25- to 9-pin adapter (included with your interface package) into the computer, and plug the interface cable into the adapter.

---

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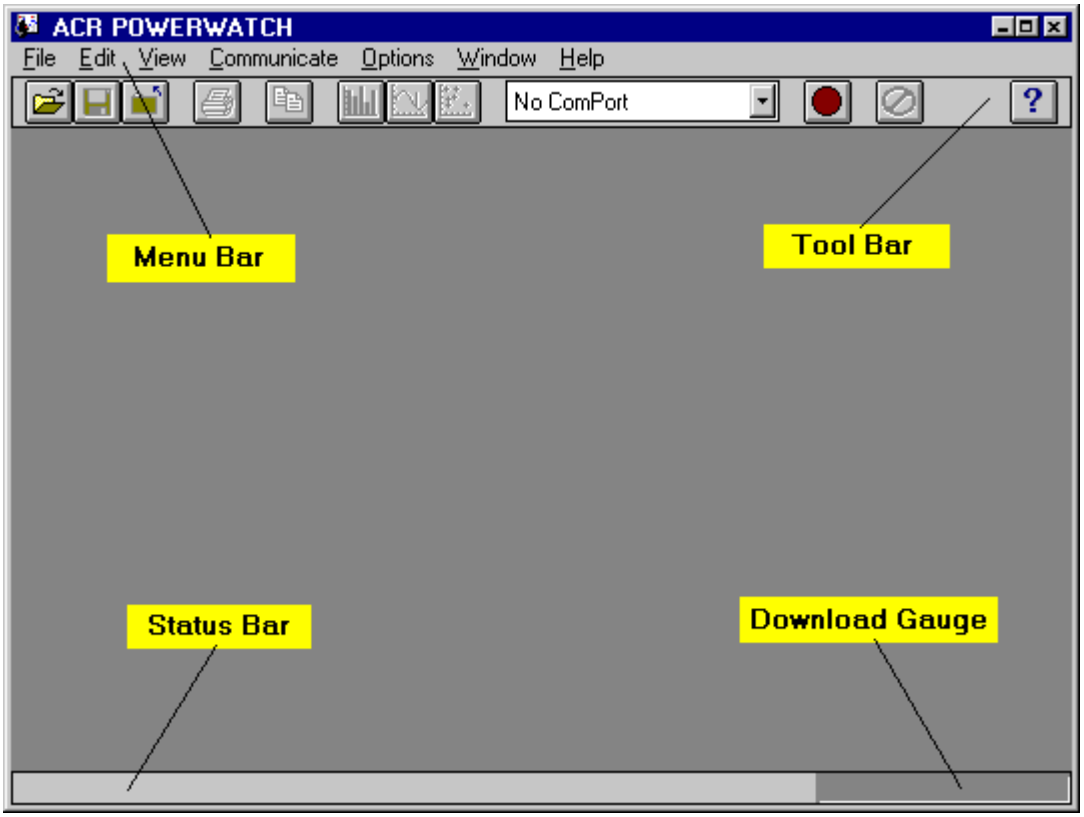
### 5.1.2 Starting the Program

# Starting the Program

- Windows 3.1 users double-click the **PowerWatch** program icon under the ACR Info Loggers group window.
- Windows 95, 98, NT users click **Start** on the **Taskbar**, and choose **Programs**, **ACR Info Loggers** and then **PowerWatch**.

The main PowerWatch window will open.

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### 5.1.2.1 COM port selection

# COM port selection

The PowerWatch progam communicates with a VDR through a Lite-Link interface cable which connects to a COM port (serial port) on your computer.

### Selecting a COM Port

With the PowerWatch main window open, from the Communicate menu choose the COM port that the Lite-Link interface cable is connected to. When you have connected the Lite-Link cable to your computer, you must, in the PowerWatch program, choose that COM port.

The Communicate menu displays the available COM ports on your computer.

When you have chosen the correct port, the Lite-Link wand and the red scanning button on the ToolBar will start to flash. When the wand is flashing it is ready to communicate with a VDR. If the wand doesn't flash, please refer to the Troubleshooting section of this guide.

---

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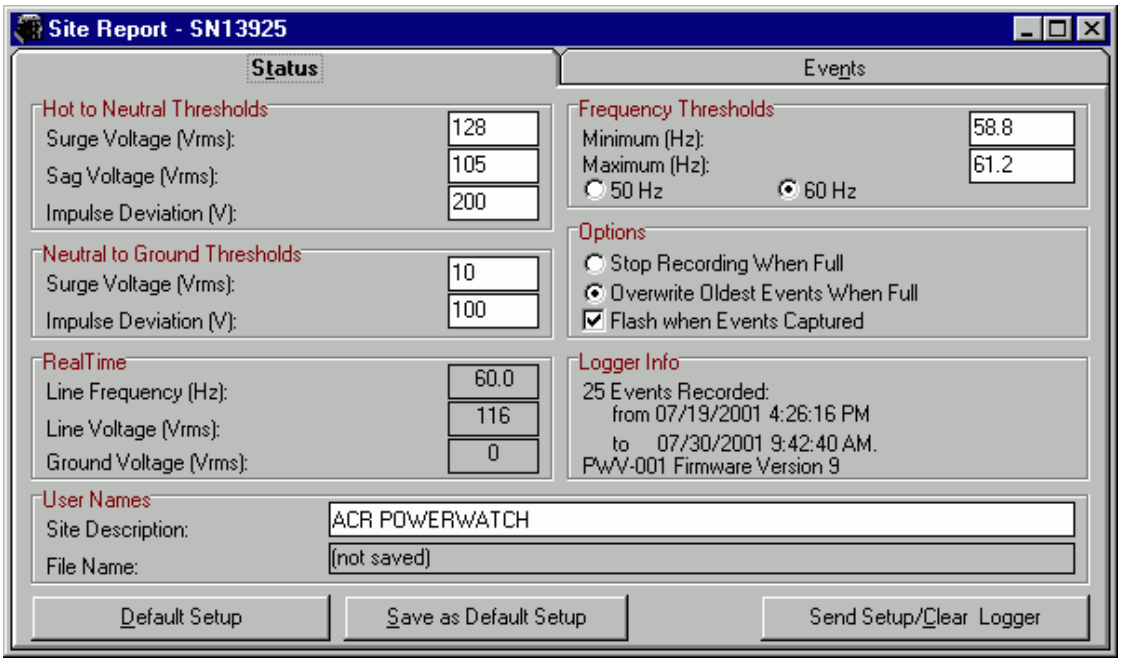
5.1.2.2 **Opening the Site Report**

# Opening the Site Report Window

1. With the main PowerWatch window open, the Lite-Link interface cable connected to a COM port, and the red scan button flashing, point the Lite-Link wand at the optical port of the VDR (from 12mm (0.5") away or closer) or plug the wand directly into the VDR's recessed optical port.

The Site Report window will open.



The Site Report window displays the VDR's settings and its recorded events.

2. Remove the Lite-Link wand from the VDR.

---

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5.1.2.3 **Threshold Settings**

# Threshold Settings

### Setting Thresholds on the Status Tab

The thresholds are divided into three categories on the Status tab of the Site report window: Hot to Neutral, Neutral to Ground, and Frequency. Within these are Events: impulses, surges, sags, outages, and line frequency variations.

To change any threshold setting, double-click the setting and then type in the new value.

See also:
Realtime Readings
Operating Options
Site Description
Logger Info

---

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5.1.2.3.1 **Events**

# Events

A PowerWatch VDR records four types of events:
- Voltage Impulses (spikes)
- Voltage Surges
- Voltage Sags (and outages)
- Line Frequency Variations

The Event column on the Events tab of the Site Report window displays the types of events that occurred.

See also:
Events Tab
Frequency events

Impulse events
Sag events
Surge events
Outage events
Loss of Synchronization events

---

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5.1.2.4 **Default threshold settings**

# Default Threshold Settings

The PowerWatch program has factory-installed default threshold settings. These settings are adequate for most applications.

Since there is a 110V VDR and a 220V VDR, two default threshold templates are provided. Connecting with a VDR will automatically use the appropriate one.

To see the default threshold settings on the Status tab, click the **Default Settings** button.

If you are concerned that some of your electronic equipment may have particular power quality requirements, we suggest that you call the equipment manufacturer for that information. You may discover that you should alter some of the VDR's threshold settings in order to monitor power quality closer.

See also:
Changing Default Threshold Settings

---

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5.1.2.5 **Changing default threshold settings**

# Changing Default Threshold Settings

If PowerWatch's default template threshold settings do not suit your application, you may choose new settings and designate them as the default settings.

1. Make your changes to the settings (on the Status tab of the Site Report window).

2. Click the **Save as Default Setup** button.

3. In the dialog box that appears, click **OK** to confirm that the default settings will be changed.

These settings are now saved in your computer and can be sent to any VDR.

See also:
Default Threshold Settings
Events
Frequency events
Impulse events
Sag events
Surge events

---

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5.1.2.6 **Operating options**

# Operating Options

PowerWatch can store 4,000 events and can be programmed to either stop recording events when it is full or continue recording over the oldest events in its memory.

Choose either **Stop Recording When Full** or **Overwrite Oldest Events When Full**.

Check **Flash When Data Available** to enable the PowerWatch to blink when it has stored one or more events.

**IMPORTANT**: The flash feature must be disabled if the PowerWatch is connected to a modem at a remote site.

See also:
Threshold Settings
Realtime Readings
Site Description
Logger Info

---

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5.1.2.7 **Site Description**

# Site Description

Site Description, on the Status tab of the Site Report window, gives the

opportunity of specifying the location of the VDR, for instance, if you need to distinguish between the locations of three PowerWatchs in one office. You may describe the site in your own words using up to 30 characters. The site description will also appear as the title of a Quick Summary, an Impulse Graph and an Event Distribution Graph.

See also:
Threshold Settings
Realtime Readings
Operating Options
Logger Info

---

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**5.1.2.8 Realtime Readings**

# Realtime Readings

After establishing communication with PowerWatch, leave the wand in the optical port while the VDR is plugged into an outlet to see, in real time:

- Line voltage readings (the voltage between the hot and neutral lines).
- Ground voltage readings (the voltage between the neutral and ground lines).
- Line frequency readings (the frequency between the hot and neutral lines).

These readings appear under the "RealTime" heading. Note that if PowerWatch is not plugged into an outlet while the wand is in the optical port, real time monitoring will stop after about 25 seconds to conserve battery life.

See also:
Threshold Settings
Operating Options
Site Description
Logger Info

---

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**5.1.2.9 Logger Info**

# Logger Info

Logger Info, on the Status tab of the Site Report window, displays the number

of events saved in the VDR and the time span over which the data was collected.

If no events have been gathered, the words **No Events Stored** will be displayed.

See also:
Threshold Settings
Realtime Readings
Operating Options
Site Description

---

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**5.1.2.10 Sending the setup to a VDR**

# Sending the setup to a PowerWatch VDR

1. Place the wand into the optical port of the VDR.

2. If you have changed threshold settings or you are leaving the settings the way they are, click **Send Setup/Clear Logger** button.

If you are changing the VDR's settings to the default settings, click **Default Settings** and then click **Send Setup/Clear Logger** button.

3. In the dialog box that appears, click **Yes** to confirm that all previous events will be cleared from the VDR.

The new settings will be saved in the VDR.

4. Remove the Lite-Link wand from the VDR.

The VDR will begin monitoring when plugged into a standard convenience outlet.

See also:
Retrieving events from a VDR

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5.1.3 **Retrieving and Saving Events**

# Retrieving and Saving Events

- **Retrieving events from a VDR**
- **Saving events**
  Site Report Window
- **Dynamic Data Exchange (DDE)**

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5.1.3.1 **Retrieving events from a VDR**

# Retrieving events from a VDR

1. With the Main PowerWatch window open, and with the Lite-Link connected to your computer, ensure that the wand is blinking. If it is not, choose **Scan** from the **Communicate** menu (or, on the ToolBar, click the red scan button so that it flashes).

2. Place the wand into the VDR's optical port. The Site Report window will open at the Status tab.

3. To download the VDR's stored events to your computer, click the **Events** tab.

Downloading will start. During download the Cancel Download button (to the right of the Scan button) will become activated enabling you to stop the download. When all the VDR's events have been copied to your computer, *Downloading complete* will appear on the status bar at the bottom of the Site Report window.

4. Remove the wand from the VDR.

See also:
Saving Events

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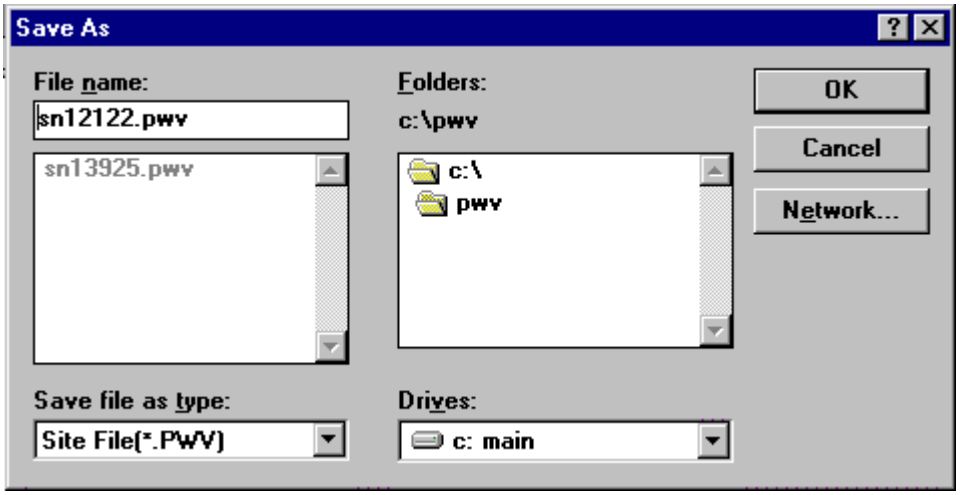
5.1.3.2 Saving Events

# Saving Events

To save the events that you have downloaded from a VDR, choose **Save** from the **File** menu or click the **Save** button on the **Toolbar**.

The Save As dialog box will appear with the current file name highlighted in the File Name box.



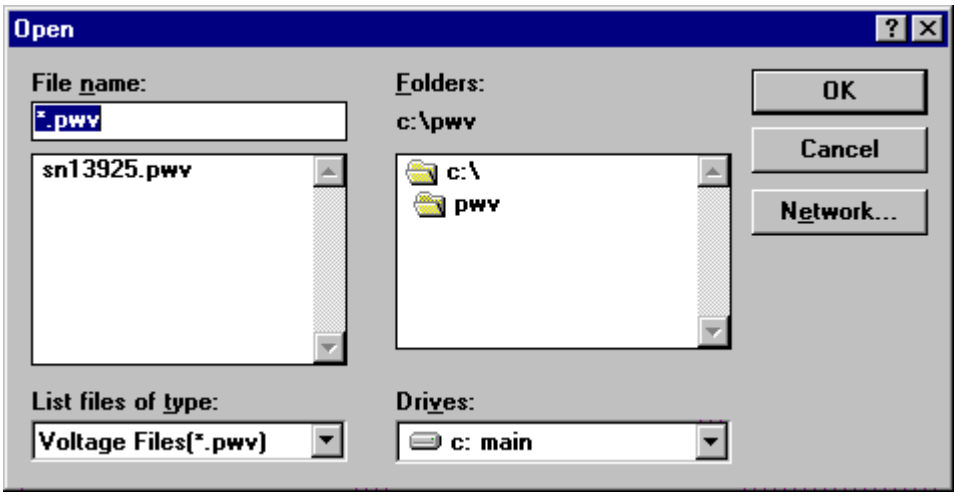

You have two saving options:

- Save the file with the existing name; this means that you will overwrite the previous file of the same name along with all its data. To do this, click **OK** and then click **Yes** to replace the previous file.
- Save the file with a new name; this means that you will type a new name for the file so that the previous file will still exist. To do this, in the File name box, type a new name over the highlighted file name and click **OK**.

### Opening an Already Saved File

1. From the **File** menu choose **Open Site File**.

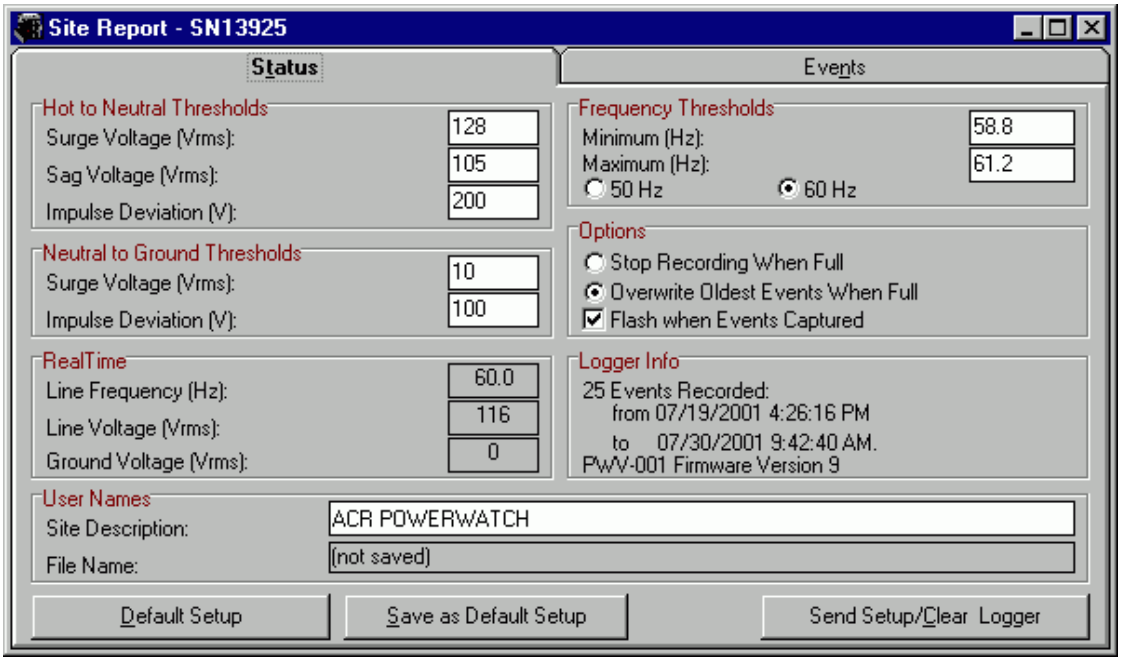
   The Open dialog box will appear.




2. Scroll through the list of site files until you find the file you want.

3. Double-click the selected file (or click it and then **OK**) to open the Site Report window.

The Site report window will open at the Status tab.




On the Status tab, notice that the items that cannot be changed are "greyed out". Only the site description and the file name can be changed.

See also:
Exporting Files

Frequency events
Impulse events
Sag events
Surge events
Outage events
Loss of Synchronization events

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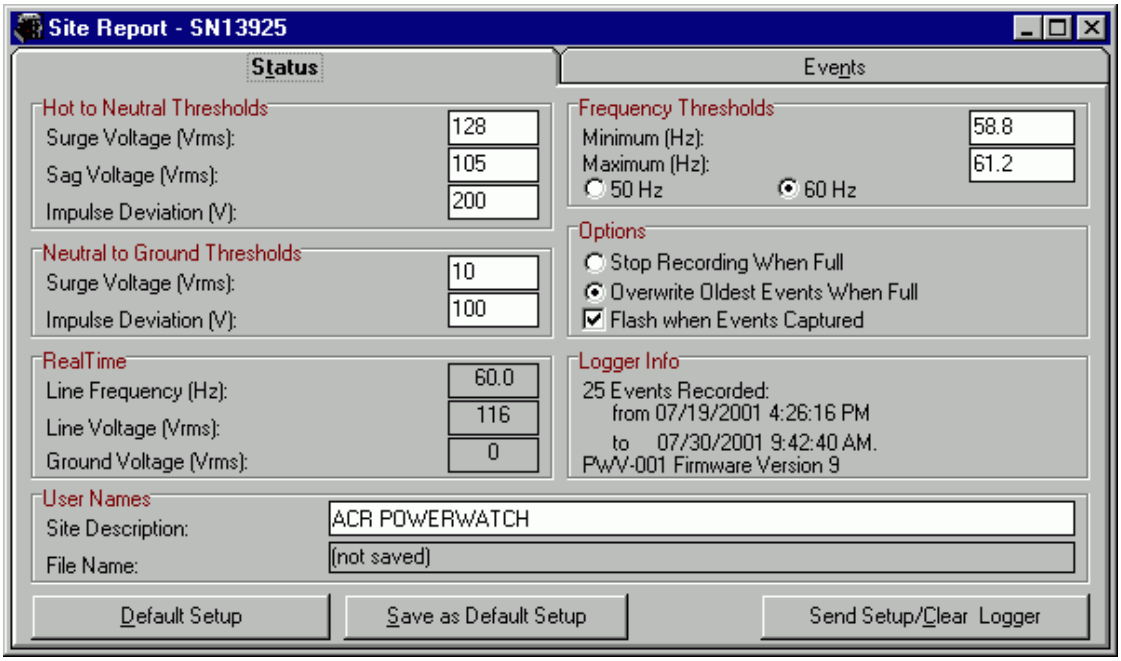
5.1.3.2.1 Site Report Window

# Site Report Window




The Site Report Window displays all the VDR's settings and events. It is a tabbed window, displaying Threshold Settings on the Status Tab and events that have occurred on the Events Tab.

A Site Report window is used to show data from saved PowerWatch files as well as "live" data from a VDR that is connected to your computer.

**Flash when Events Captured** tells the logger to flash the LED when it has events stored.

**Important** Flash MUST be disabled when the logger is connected to a Modem.

**50 Hz** and **60 Hz** options select between 50Hz and 60Hz operation.

**RealTime**

**Line Frequency** shows the frequency between the Hot and Neutral Lines
**Line Voltage** shows the voltage between the Hot and Neutral Lines
**Ground Voltage** shows the voltage between the Neutral and Ground Lines

**Logger Info**

**<#> Events Recorded** shows how many events have been captured
**From <date>** shows when the logger started recording
**To <date>** shows when the logger stopped recording (the time you contacted the VDR)
**No Events Stored** is self descriptive
**Firmware Version** shows the current version of firmware used in the logger

**User Names**

**Site Description** is a 30 character string which describes the logger location. This string is used on the graphs.
**File Name** is the name of the saved site file.

**Buttons**

**Default Setup** sets the PowerWatch to the default settings specified in the PWV.INI file.
**Save as Default Setup** saves the current settings to the PWV.INI file for use as the default settings.
**Save Setup and Clear Logger** saves the current settings to the logger. **Important: Any events stored on the logger will be cleared.**

See also:
Event Tab

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5.1.3.3 **Dynamic Data Exchange (DDE)**

# Dynamic Data Exchange (DDE)

PowerWatch can be used as a DDE source. The Site Report has a number of fields to which links may be made.

To access these fields, you must specify the Application name (PWV), the Window (PWVSite) and the field in which you are interested. For instance, to get the current line voltage from PowerWatch to Excel, you would add the following equation to an Excel Spreadsheet.

= PWV|PWVSite!RealVolt

To get the serial number, you would add the following equation

=PWV|PWVSite!Serial

Here is a list of some of the fields you can access through DDE:

| | |
|---|---|
| HNSurgeBox | - Surge Threshold between Hot and Neutral |
| HNSagBox | - Sag Threshold between Hot and Neutral |
| HNImpBox | - Impulse Threshold between Hot and Neutral |
| NGSurgeBox | - Surge Threshold between Neutral and Ground |
| NGImpBox | - Impulse Threshold between Neutral and Ground |
| RealFreq | - Line frequency right now |
| RealVolt | - Line voltage right now |
| RealGnd | - Ground voltage right now |
| MinFreqBox | - Minimum Frequency Threshold |
| MaxFreqBox | - Maximum Frequency Threshold |
| ToDate | - Last recorded event date |
| ToTime | - Last recorded event time |
| FromDate | - Date logger started recording |
| FromTime | - Time logger started recording |
| Serial | - Serial number of logger. |

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## 5.2 Displaying and Printing Events

# Displaying and Printing Events

- **Events Tab**
  - Open Event
  - Impulses
  - Impulse Events
  - Sag Events
  - Surge Events
  - Outage Events
  - Frequency Events
  - Loss of Synchronization Events
  - Line Frequency Variations
- **Viewing Events**
  - Viewing Events as a Bar Graph (Quick Summary)
  - Viewing a Single Impulse as a Graph
  - Viewing Events as an Event Distribution Graph
  - Changing Graph Styles
- **Printing Events**

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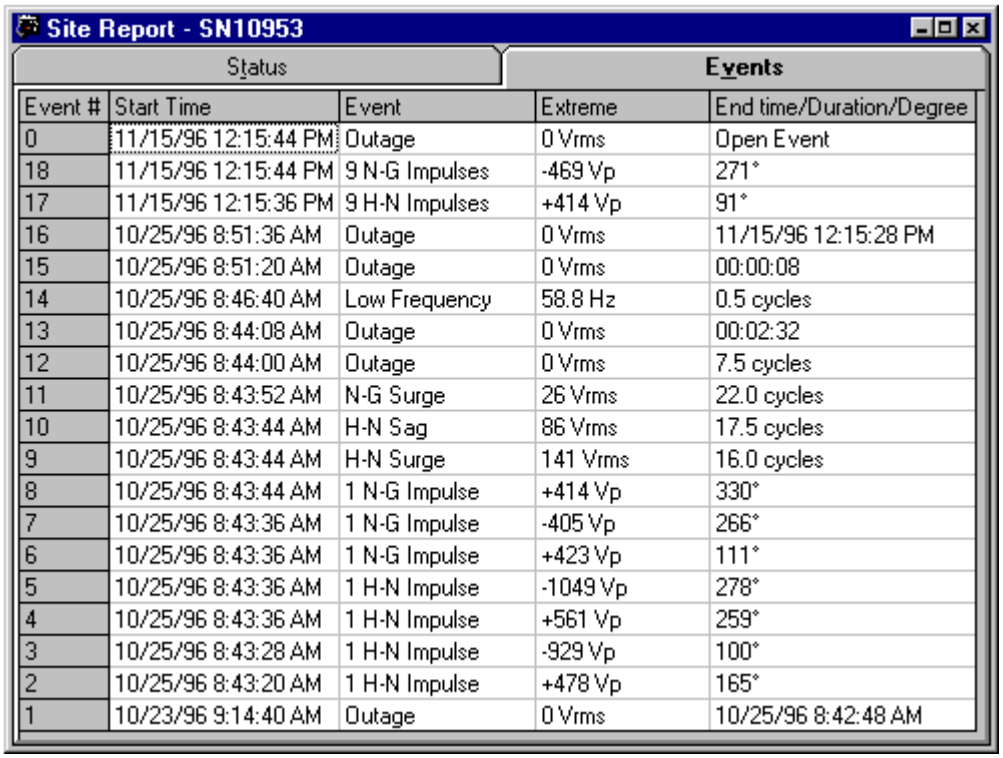
### 5.2.1 Events Tab

# Events Tab

Having downloaded a VDR's events, and with the Events tab still open, you can view and analyze the data that the VDR has gathered since it was last cleared. A VDR can store 4,000 events.



Site Report - SN10953

Status | Events

| Event # | Start Time | Event | Extreme | End time/Duration/Degree |
|---|---|---|---|---|
| 0 | 11/15/96 12:15:44 PM | Outage | 0 Vrms | Open Event |
| 18 | 11/15/96 12:15:44 PM | 9 N-G Impulses | -469 Vp | 271° |
| 17 | 11/15/96 12:15:36 PM | 9 H-N Impulses | +414 Vp | 91° |
| 16 | 10/25/96 8:51:36 AM | Outage | 0 Vrms | 11/15/96 12:15:28 PM |
| 15 | 10/25/96 8:51:20 AM | Outage | 0 Vrms | 00:00:08 |
| 14 | 10/25/96 8:46:40 AM | Low Frequency | 58.8 Hz | 0.5 cycles |
| 13 | 10/25/96 8:44:08 AM | Outage | 0 Vrms | 00:02:32 |
| 12 | 10/25/96 8:44:00 AM | Outage | 0 Vrms | 7.5 cycles |
| 11 | 10/25/96 8:43:52 AM | N-G Surge | 26 Vrms | 22.0 cycles |
| 10 | 10/25/96 8:43:44 AM | H-N Sag | 86 Vrms | 17.5 cycles |
| 9 | 10/25/96 8:43:44 AM | H-N Surge | 141 Vrms | 16.0 cycles |
| 8 | 10/25/96 8:43:44 AM | 1 N-G Impulse | +414 Vp | 330° |
| 7 | 10/25/96 8:43:36 AM | 1 N-G Impulse | -405 Vp | 266° |
| 6 | 10/25/96 8:43:36 AM | 1 N-G Impulse | +423 Vp | 111° |
| 5 | 10/25/96 8:43:36 AM | 1 H-N Impulse | -1049 Vp | 278° |
| 4 | 10/25/96 8:43:36 AM | 1 H-N Impulse | +561 Vp | 259° |
| 3 | 10/25/96 8:43:28 AM | 1 H-N Impulse | -929 Vp | 100° |
| 2 | 10/25/96 8:43:20 AM | 1 H-N Impulse | +478 Vp | 165° |
| 1 | 10/23/96 9:14:40 AM | Outage | 0 Vrms | 10/25/96 8:42:48 AM |

**Event # Column**
The Events column displays the number sequence of each event, with the most recent events displayed first. By using the scroll bar on the right of the window, all the events that the VDR has recorded can be viewed. The number 0 is given to an Open Event.

**Start Time Column**
The Start Time column displays the time that an event started. The resolution of the time stamp in a VDR is eight seconds. Therefore, if an impulse occurred once every second starting at 12:00:00, the first eight impulses would all be reported to have the same time of 12:00:00. The next eight impulses would be reported as having the same time of 12:00:08. Also, if identical information was downloaded twice from a VDR, the two site reports could show a time difference of eight seconds.

**Event Column**
The Event column displays the types of events that occurred during the reporting period.

**Impulse Events** An Impulse Event is a transient voltage surge. The event column will display the number of impulses that the VDR was able to count. For instance, in the Event tab displayed above, event #8 is one impulse; event #18 is made up of nine impulses.

**Surge and Sag Events** Surge and sag events are increases and decreases in line voltage that are outside the thresholds for at least one full cycle. Surges

can occur on the hot-neutral lines or on the neutral-ground lines. Sags are only measured on the hot-neutral lines.

**Outage Events** An Outage Event is a 0 voltage sag (for example, event #16 listed above).

**High and Low Frequency Events** Frequency events are recorded when the frequency is outside the preset frequency thresholds.

**Loss of Synchronization** Excessive harmonics or noise on a power line may cause severly distorted voltage waveforms. While not common, these distorted waveforms could result in "extra" zero crossings on the AC line. PowerWatch synchronizes itself to the consecutive positive and negative zero crossings of the AC line (every 8.33 milliseconds). Should the voltage waveform be so highly distorted that unexpected zero crossings are detected, PowerWatch will report a loss of synchronization relative to the measured voltage waveform.

**Extreme Column**
The Extreme column displays the maximum value measured during the event.

**End Time/Duration/Degree Column**
This column displays the duration of an event, or the time that the event ended, or, in the case of a single impulse, the event's position on the sine wave (in degrees).
Information is displayed according to the length of the event.

- Events of less than one second are displayed in number of cycles.
- Events of one to 119 seconds are displayed in seconds. Outages up to 16 seconds are recorded in 0.5 cycle resolution, otherwise the outage resolution is eight seconds.
- Events of between two minutes and 24 hours are displayed in hours, minutes and seconds for example, 07:51:24 (7 hours, 51 minutes, and 24 seconds).
- Events that last longer than 24 hours display the end time (date and time).

If an event was still in progress when data was downloaded from the VDR, the event will be designated as an open event in this column. PowerWatch can display one each of three open event types simultaneously. Open events are assigned the number zero in the Event # column.

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#### 5.2.1.1 Open Event

# Open Event

An event which has not yet terminated.

#### 5.2.1.2 Impulses

# Impulses

Impulses are transient voltage fluctuations (sometimes called spikes). They can be positive or negative and can occur on the hot-neutral line or on the neutral-ground line. Impulses typically have a duration far below one cycle time and can be detected below microsecond.

PowerWatch will record any voltage deviation above the impulse limit and of less than one cycle duration as an impulse event.

#### 5.2.1.3 Impulse events

# Impulse Events

Impulses are transient voltage fluctuations (sometimes called spikes), can be positive or negative, and can occur on both the hot-neutral line and the neutral-ground line. The voltage potential of an impulse can be quite large; hundreds of volts is not uncommon. Impulses typically have a duration far below one cycle time and can be detected below a microsecond. PowerWatch will record any voltage deviation above the impulse threshold of less than one cycle duration as an impulse.

PowerWatch can detect both positive and negative impulses down to one microsecond in duration on both the H-N and N-G lines. If the voltage exceeds the impulse deviation threshold within one half cycle, an impulse event will be recorded. An impulse event can include one or more impulses occurring within the same half cycle. The event column will display the number of impulses that the PowerWatch was able to count.

An important point to note about a multiple impulse event is that the voltage reading in the Extreme column will be the total voltage of any impulses that occur more than 100 microseconds apart. When multiple impulses of different polarity occur, their absolute values are added together. The degree (in the fourth column) will be the position in the cycle of the first impulse. The angle of neutral-ground impulses is referenced to the start of the hot-neutral sine wave.

If an impulse is less than one microsecond in length, PowerWatch will measure the magnitude of the impulse but may be unable to determine the polarity. In this case, PowerWatch will show the sign of the impulse as "+" (firmware version 4 or greater).

See also:
Events
Frequency events
Sag events
Surge events
Outage events
Loss of Synchronization events

---

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5.2.1.4 **Sag events**

# Sag Events

Sags are decreases in line voltage lasting for at least one cycle. Sags are only measured on the hot-neutral lines. Typically, a sag will range from a few volts to tens of volts below normal.

If the voltage drops below the sag threshold, a sag event will be recorded. If it drops below 70V, the event will be recorded by PowerWatch as an outage.

See also:
Events
Frequency events
Impulse events
Surge events
Outage events
Loss of Synchronization events

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5.2.1.5 **Surge events**

# Surge Events

Surges are increases in line voltage that last at least one full cycle. Surges can occur on both the hot-neutral line or neutral-ground line.

Typically, surges are in the order of tens of volts and last from several cycles to several seconds.

If the voltage exceeds the surge voltage threshold for longer than one cycle, a surge event will be recorded.

See also:

Events
Sag events
Frequency events
Impulse events
Outage events
Loss of Synchronization events

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5.2.1.6 **Outage events**

# Outage Events

When PowerWatch records a sag of below 70Vrms for longer than a second it displays the event as an outage. The VDR will go into self-powered mode (battery) and will sample the voltage every eight seconds. As a result, the shortest outage it will record will be eight seconds. When the power is reapplied to PowerWatch, the VDR will not detect it immediately, but will wait until the next eight-second sample before returning to the line powered operational mode. This delay will prevent contact bounce being reported as an event when PowerWatch is plugged into a standard electrical outlet.

Since PowerWatch's eight-second clock is not synchronized with outages, it can sometimes report an outage as 16 seconds when in fact the outage only lasted for slightly over one second. An example of when this would happen is if a sag below 70Vrms occurred 6.9 seconds into an eight-second period. At the 7.9-second point, PowerWatch would change to self powered mode and report a minimum outage of eight seconds. If then, at the 8.1-second point, power was restored, the VDR would not sample again until the 16-second point.

See also:
Events
Impulse events
Sag events
Surge events
Frequency events
Loss of Synchronization events

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5.2.1.7 **Frequency events**

# Frequency Events

Frequency events are variations in frequency above or below the nominal frequency (for example, 60Hz in North America and 50Hz in Europe). Variations in frequency are typically a few cycles and can be from seconds to minutes in duration.

If the frequency drops below the minimum threshold a low frequency event will be recorded; if it exceeds the maximum threshold a high frequency event will be recorded.

The factory default nominal frequency is 60Hz for 110V models and 50Hz for 220V models. However, PowerWatch can be user configured to record at 50Hz and 60Hz for either 110V or 240V models.

See also:
Events
Impulse events
Sag events
Surge events
Outage events
Loss of Synchronization events

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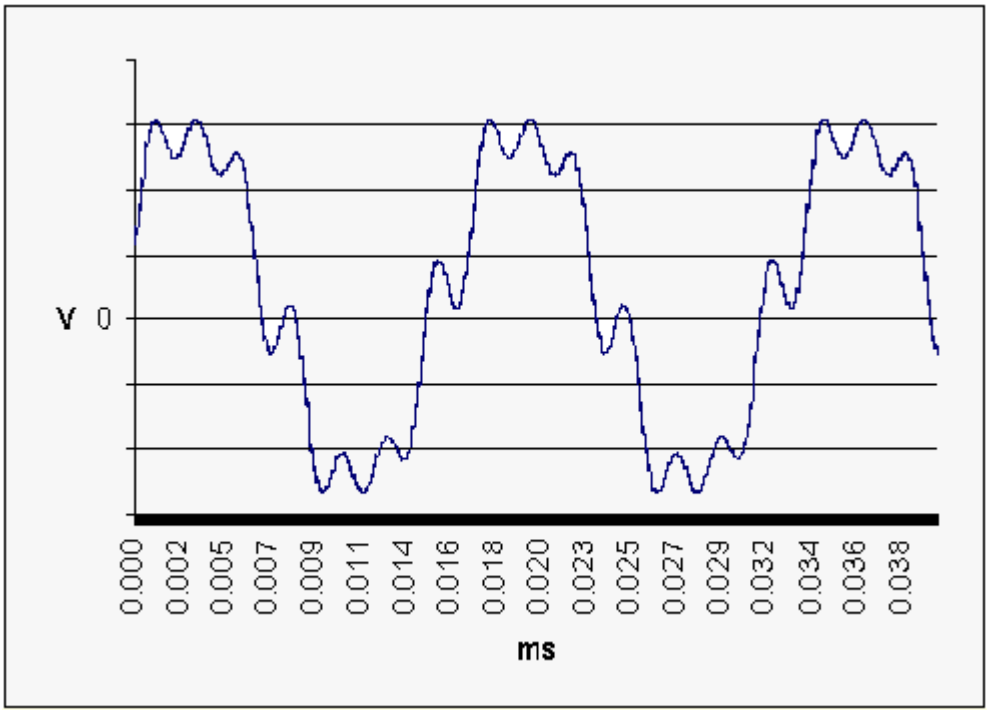
5.2.1.8 **Loss of Synchronization Event**

# Loss of Synchronization Event

Excessive harmonics or noise on a power line may cause severly distorted voltage waveforms. While not common, these distorted waveforms could result in "extra" zero crossings on the AC line.




PowerWatch synchronizes itself to the consecutive positive and negative zero crossings of the AC line (every 8.33 milliseconds). Should the voltage waveform be so highly distorted that unexpected zero crossings are detected, PowerWatch will report a loss of synchronization relative to the measured voltage waveform. This Loss of Synchronization will be recorded as an event until such time as:

- the zero crossing distortion ends; or
- the reported voltage drops below 70V (a detected outage). In this situation, the Loss of Synchronization event will change to an Outage event (while keeping the original start time and duration).

PowerWatch has a resolution of 8 seconds, so events shorter than this duration will have a time stamp of "< 8 seconds".

See also:
Events
Impulse events
Sag events
Surge events
Outage events
Frequency events

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5.2.1.9 **Line Frequency Variations**

# Line frequency variations

Frequency variations are changes in frequency above or below the nominal frequency (60Hz in North America, 50Hz in Europe, for example). If the frequency drops below the minimum threshold a low frequency event will be recorded; if it exceeds the maximum threshold a high frequency event will be recorded.

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5.2.2 **Viewing Events**

# Viewing Events

- Viewing Events as a Bar Graph (Quick Summary)
- Viewing a Single Impulse as a Graph
- Viewing Events as an Event Distribution Graph
- Changing Graph Styles

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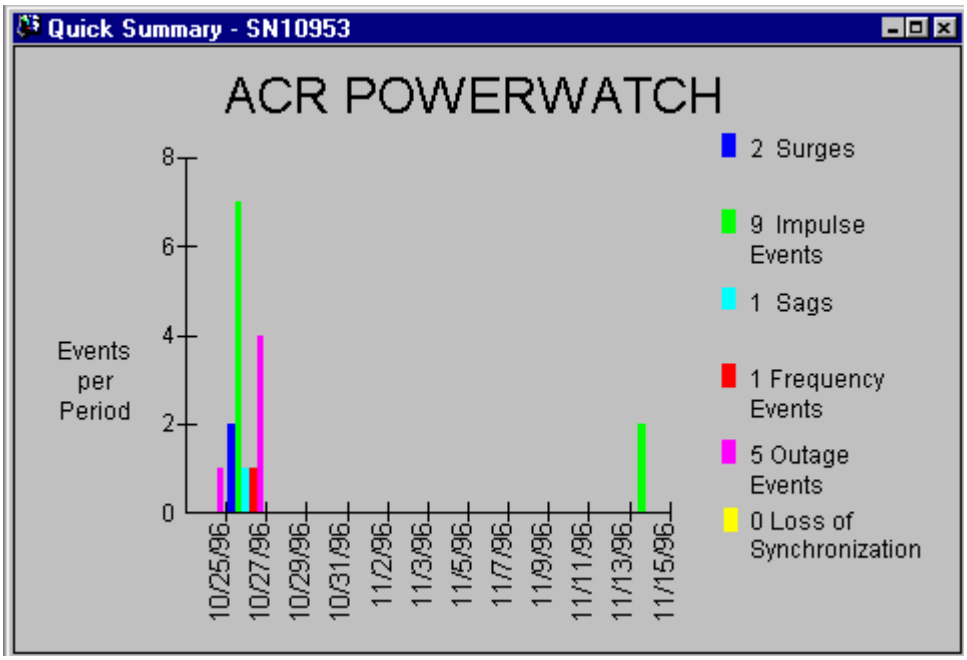
5.2.2.1 **Viewing Events as a Bar Graph (Quick Summary)**

# Bar Graph (Quick Summary)




Quick Summary displays the number of surge, sag, impulse, and frequency events as bars on a graph. Outages are included with sags .

The horizontal axis displays time; the vertical axis displays the number of events that occurred in each time period. In the Quick Summary above, the time periods are sorted by date.

Note that the thickness of a bar and its position in a time period is irrelevant; the bar only displays the number of events and the time period they occurred in.

**Choosing Viewing Options**

The Graph Setup dialog box gives you a number of viewing options.

1. To open this dialog box, choose **Show Graph Setup** from the **Options** menu so that there is a check mark in front of it.

2. Then, choose **Quick Summary** from the **View** menu.

The Graph Setup dialog box will appear enabling you to make your display choices.

3. Make your choices from the following options:

**All Data** or **Selected Data** - To display all relevant events, click **All Data**. To display a block of events from the Events tab, select those events by dragging the pointer through them to highlight.

**Show Hot to Neutral Events** - Check this box to display all hot to neutral events.

**Show Neutral to Ground Events** - Check this box to display all neutral to ground events.

**Sort by Date** or **Sort into Equal Periods** - If you want the horizontal axis divided on a daily basis, click **Sort by Date**. If you want to divide the horizontal axis into shorter or longer periods, click **Sort into Equal Periods** and type the number of periods you want to display.

4. When you have finished choosing your options, click **OK** to close the dialog box and to open the Quick Summary.

If more detailed analysis is needed, it may be better to export the file to a spreadsheet or database for further manipulation.

A Quick Summary can be saved in either a bitmap (BMP) or metafile (WMF) format. In most cases, a metafile format is preferred since it is smaller, is easily scaled, and prints better. However, some applications (such as MS-PAINT) can only handle the BMP format.

To Edit the graph, right-click anywhere in the graph to open the Graph Control dialog box.

See also:
Printing events

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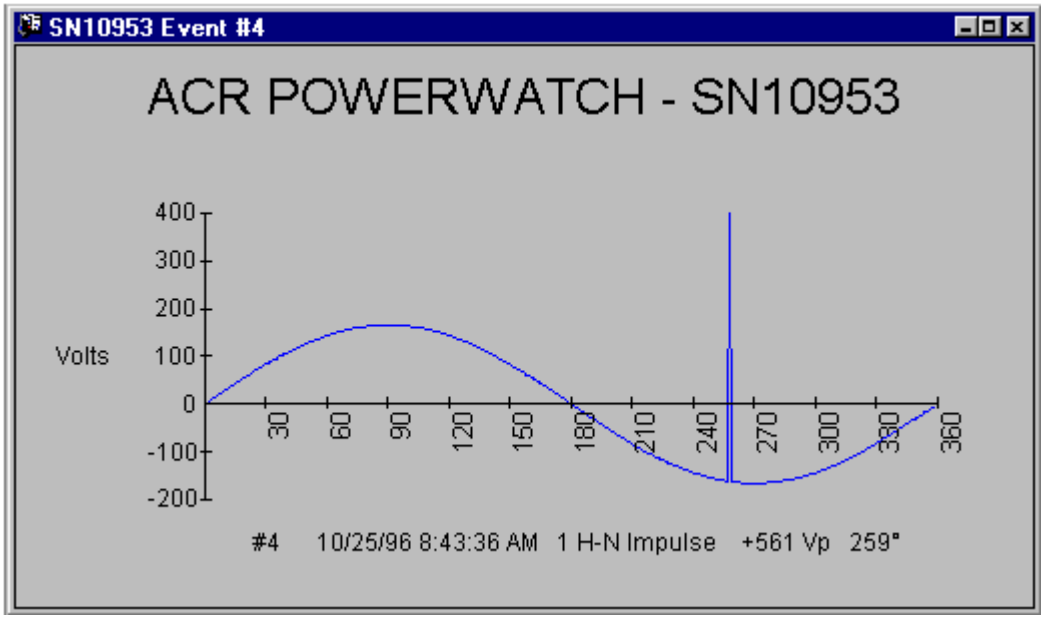
5.2.2.2 **Viewing a Single Impulse as a Graph**

# Single Impulse as a Graph




A single impulse event between hot and neutral or neutral and ground can be displayed as a graph, enabling you to see if the impulse is causing zero crossings.

An impulse graph is produced using the amplitude, direction and position (in degrees) of the event. The graphical representation is not intended to show what the wave form looks like nor does it show the duration of the impulse.

To graph an impulse you must choose an event that contains only one impulse; it is not possible to graph an event consisting of multiple impulses .

1. With the Site Report window open at the Events tab, double-click the single-impulse event you want to graph.

(There are two other ways of opening an impulse graph: select the single-impulse event you want to graph by clicking it, and then, either choose **Single Impulse**...from the **View** menu. or click the **View Single Impulse** button on the Toolbar.)

2. To open the dialog box of display options, right-click the mouse with the pointer in the graph.

See also:
Impulse events
Printing events

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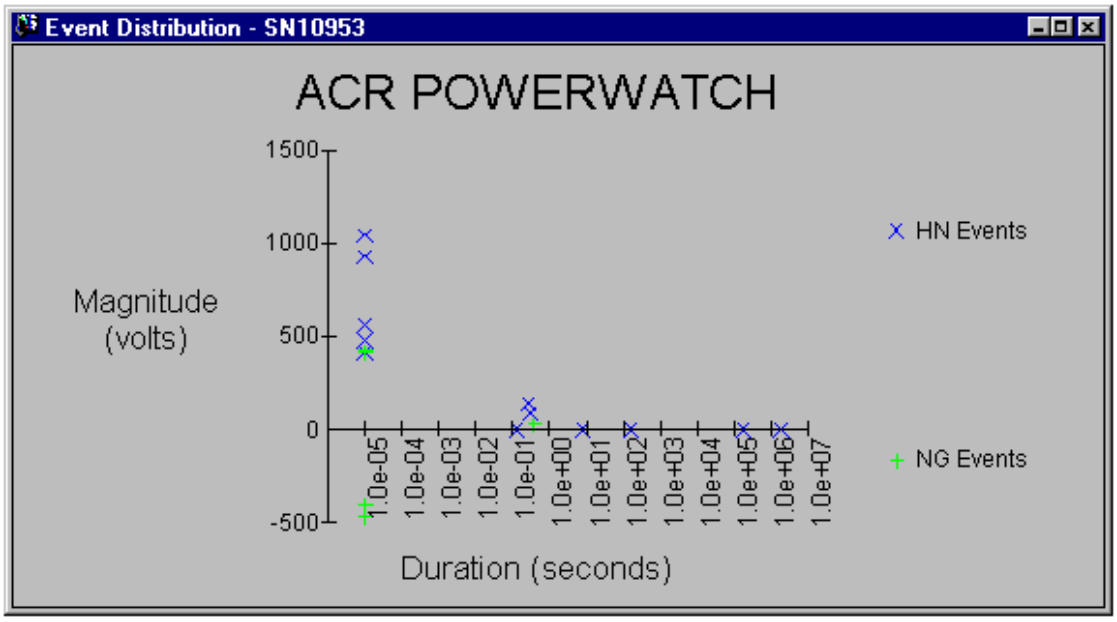
### 5.2.2.3 Viewing Events as an Event Distribution Graph

# Event Distribution Graph




The Event Distribution Graph plots the magnitude of the event against duration on a logarithmic scale in order to determine the importance of the data. For example, a single random event may not be as significant as a cluster of recurring events.

This information can be interpreted using the CBEMA Curve found in Appendix B, Power Quality Issues, in the PowerWatch Reference Guide.

With the Site Report window open at the Events tab, choose **Event Distribution Graph** from the **View** menu (or click the Event Distribution button on the Toolbar).

Since the impulses  have a duration that is unknown, they are represented as having a width of 10 microseconds.

**Choosing Viewing Options**

The Graph Setup dialog box gives you a number of viewing options.

To open the dialog box, choose **Show Graph Setup** from the **Options** menu so that ther is a check mark in front of it.

Then, choose **Event Distribution** from the **View** menu.

The Graph Setup dialog box will appear enabling you to make you display choices. An explanation of these choices is given in Displaying Events as a

Bar Graph (above).

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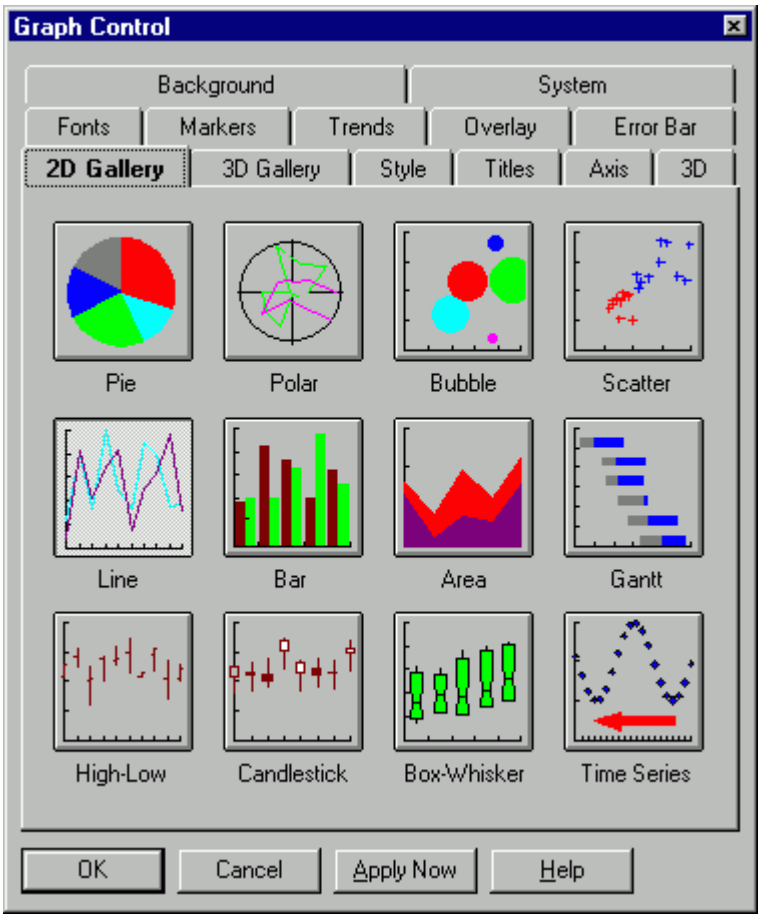
5.2.2.4 **Graph Styles/Control Dialog Box**

# Graph Styles/Control Dialog Box




The Graph Control dialog box contains a number of edit features that enable you to change the way a graph is displayed. These features include naming and placing titles, using 3D effects, and saving a graph in different formats.

Open the Graph Control dialog box by right-clicking anywhere on a graph. For explanations of the various features, click the Help button.

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**5.2.3 Printing events**

# Printing Events

The PowerWatch program enables you to print the events that a VDR has recorded.

**Printing Events from the Events Tab**
1. With the Events tab displayed, choose **Print** from the **File** menu (or click the print button on the ToolBar).

2. Choose the option you want from the Print dialog box (printing all events, printing one or more pages, or printing a number of events that have been selected).

3. Click **OK**.

The events on the Events Tab will be printed using the font and spacing used on the grid. It may be neccessary to adjust the font (using the Edit Font menu item) and adjust the column width to desired values.

**Printing a Graph**
1. With a Quick Summary, an Impulse Graph, or an Event Distribution Graph open, choose **Print** from the **File** menu (or click the print button on the ToolBar).

2. Click **Setup** from the **Print** dialog box.

3. If a longer horizontal axis than vertical axis is desired, choose **Landscape** orientation from the Print Setup dialog box.

4. Click **OK**.

5. Choose the options from the Print dialog box.

6. Click **OK.**

The size of the graph on the printed page is proportional to the size of the graph window on the screen. You can increase the size by maximizing the window. It is also possible to increase the size beyond the screen boundaries by dragging the window.

When printing a Quick Summary or Event Distribution Graph with a color printer, PowerWatch generates different colors to better distinguish event types. If a color printer is not used, PowerWatch assigns patterns instead of colors to different event types.

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## 5.3 Communicating with a Remote PowerWatch

# Communicating with a Remote PowerWatch

- **Equipment needed**
- **Modem overview**
- **Configuring the remote station modem**
  - Remote modem DIP switch settings (for configuration)
  - Remote modem setup string
  - Remote modem DIP switch settings (for operation)
- **Configuring the computer station modem**
  - Computer modem DIP switch settings
  - Computer modem setup string
  - Computer modem dial command and timeout
- **Connecting the system and testing**
  - Remote modem connection
- **PhoneBook** - Saving numbers and dialing a remote site

---

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### 5.3.1 Modem, equipment needed

# Modem, equipment needed

1. A telephone line to the remote site. Communication is limited to one VDR per phone line - you cannot communicate with multiple VDRs at a remote site over one phone line.

2. Two modems: one at your computer and one at the remote site. These modems should respond to AT commands and must be capable of transferring data at 9600 bps.

3. At least one standard modem cable. This cable connects an external modem to your computer. (Even if your computer has an internal modem you will need a modem cable for configuring the remote modem.)

4. An LIC-101 Lite-Link interface cable at the remote site.

5. A 9- to 25-pin adapter. This connects with the Lite-Link interface cable.

6. An MA-100 (a null modem adapter available from your PowerWatch dealer). This connects the 9- to 25-pin adapter to the

remote modem.

See also:
Modem overview
Remote modem connection

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**5.3.2 Modem overview**

# Modem Overview

Communication with a remote VDR is possible over a telephone line via two modems: a modem connected to your computer and a modem connected to the VDR at the remote site. Each modem must be configured before it can be used for communication.

The configuration instructions we give apply to the USRobotics Sportster 14,400. If your modems are made by another company you will have to check their manuals to get an equivalent setup string and/or DIP switch settings.

Setting up modem communication can sometimes be problematic; we have explained the operation as simply as possible in three main steps:

NOTE: Configure the remote station modem before you configure the computer station modem. The first step in remote modem configuration is:

A . Configuring the remote station modem

See the following three topics:
1. Remote modem DIP switch settings (for configuration)
2. Remote modem setup string
3. Remote modem DIP switch settings (for operation)

B. Configuring the computer station modem

See the following three topics:
1. Computer modem DIP switch settings
2. Computer modem setup string
3. Computer modem dial command

C. Connecting the system and testing

See the following two topics:
1. Connecting the remote modem
2. Dialing the remote site

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### 5.3.3 Remote modem DIP switch settings (for configuration)

# Remote modem DIP switch settings (for configuration)

See also: Modem overview

It is not possible to configure the remote station modem at the remote site. You must connect the remote station modem to your computer and configure the remote modem at the computer station before installing it at the remote site.

DIP switch settings are different for computer station and remote modems. Because you are configuring the remote modem at the computer station you must set its DIP switches to computer station settings for the configuring operation. If your remote station modem has no DIP switches you can skip this step.

1. Set the DIP switches to the computer station settings. If you have a US Robotics modem set the DIP switches to the settings in the table below.

COMPUTER STATION MODEM DIP SWITCH SETTINGS (US ROBOTICS)

| DIP Switch Number | PowerupMode | DIP Switch Setting |
|---|---|---|
| 1 | Normal DTR operation | UP |
| 2 | Verbal result codes | UP |
| 3 | Result codes | enabled DOWN |
| 4 | Echo offline commands | UP |
| 5 | Auto answer | disabled DOWN |
| 6 | Normal CD operation | UP |
| 7 | Load user defaults | UP |
| 8 | AT command | recognition DOWN |

If you have a make of modem other than US Robotics check the manual to see if the DIP switch settings are different for the modes listed in the table above.

Next step:
Remote modem setup string

See also:
Remote modem DIP switch settings (for operation)

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### 5.3.4 Remote modem setup string

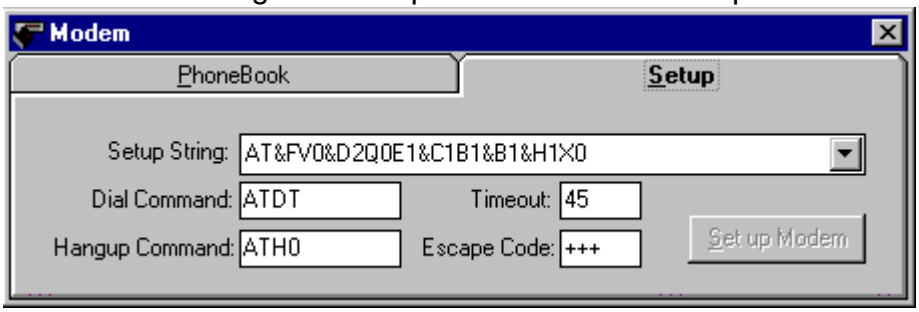
# Remote modem setup string

Previous step:
Remote DIP switch settings (for configuration)

1. Connect the remote modem to your computer using a standard modem cable.

2. Open the PowerWatch program and from the menu bar choose the COM port that the modem is connected to.

The Modem dialog box will apear. Choose the Setup tab.




3. To choose a setup string, click the *down* arrow to the right of the Setup String box. (A *string* is a series of commands.) The strings in this pulldown menu are the default settings for US Robotics Sportster 14,400 modems. The setup string for a remote US Robotics modem is:

**AT&FE0Q1S0=1&C0&D0&H0&K0&M0&W**.

Choose this string if you have a US Robotics modem. If you have another model of modem check the modem's manual to see if you need to enter a different setup string.

4. Click **Set up Modem**.

You will see a "Failed Setup String" message on the status bar at the bottom of the window; this is normal. The modem response mode command Q1 tells the modem not to respond to instructions.

5. To ensure that the setup string did work, change E0 to E1 and Q1 to Q0 temporarily, and send the string again (click **Set up Modem**).

If the modem understood the setup string the message that "Initialized modem successfully" will be displayed on the status bar.

6. Change E1 back to E0, Q0 back to Q1 and send the setup string again.

(The other commands in this dialog box apply only to the computer station modem.)

7. Disconnect the remote modem from your computer.

Next step:
Remote modem DIP switch settings (for operation)

---

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**5.3.5 Remote modem DIP switch settings (for operation)**

# Remote modem DIP switch settings (for operation)

Previous step:
Choosing the remote modem setup string

When the modem is configured correctly you can change the DIP switch settings to the remote settings.

Set the DIP switches to the remote settings. If you have a US Robotics modem set the DIP switches to the settings in the table below.

REMOTE MODEM DIP SWITCH SETTINGS (US ROBOTICS)

| DIP Switch Number | Powerup Mode | DIP Switch Settings |
|---|---|---|
| 1 | Override DTR operation | DOWN |
| 2 | Numeric result codes | DOWN |
| 3 | Result codes disabled | UP |
| 4 | Offline commands not echoed | DOWN |
| 5 | Auto answer enabled | UP |
| 6 | Normal CD operation | UP |
| 7 | Load user defaults | UP |
| 8 | AT command recognition | DOWN |

If you have a make of modem other than US Robotics, check to see if the DIP switch settings are different for the powerup modes listed in the table above.

The modem is now ready to be installed at the remote site.

Next step:
Configuring the computer station modem

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### 5.3.6 Computer modem DIP switch settings

# Computer modem DIP switch settings

Set the DIP switches to the computer station settings. If you have a US Robotics modem, set the DIP switches to the settings in the table below. If your computer station modem has no DIP switches you can skip this step.

COMPUTER STATION MODEM DIP SWITCH SETTINGS (US Robotics)

| DIP Switch Number | Powerup Mode | DIP Switch Setting |
|---|---|---|
| 1 | Use Normal DTR operation | UP |
| 2 | Use Verbal result codes | UP |
| 3 | Enable Result codes | DOWN |
| 4 | Echo local commands | UP |
| 5 | Disable Auto answer | DOWN |
| 6 | Use Normal CD operation | UP |
| 7 | Load user defaults | UP |
| 8 | Recognize AT commands | DOWN |

If you have a make of modem other than US Robotics, check to see if the DIP switch settings are different for the powerup modes listed in the table above.

Next step:
Computer modem setup string

See also:
Setting the dial command

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### 5.3.7 Computer modem setup string

# Computer modem setup string

Previous step:
Computer modem DIP switch settings

1. At your computer, using a standard modem cable, connect the computer station modem to an available serial port on your computer. (This step is unnecessary if you have an internal modem installed in your computer.)

2. Open the PowerWatch program and from the menu bar choose the COM port that the modem is connected to.

The Modem dialog box will appear. Choose the Setup tab.

3. To choose a setup string click the down arrow to the right of the Setup String box. The strings in this pulldown menu are the default settings for the US Robotics Sportster 14,400 modem. The computer station setup string for a US Robotics modem is:

**AT&FV0&D2Q0E1&C1B1&B1&H1X0**

Choose this string if you have a US Robotics modem. If you have another model of modem check the modem's manual to see if you need to enter a different setup string.

If the modem understood the setup string, the message "Initialized modem successfully" will be displayed on the status bar.

Next step:
Computer modem dial command

---

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**5.3.8 Computer modem dial command & timeout**

# Computer modem dial command

Previous step:
Computer modem setup string

**Setting the Dial command**
The dial command is the string that commands the modem to initiate a dialing operation. AT is the command prefix.

If your phone line has tone dial for a touch tone phone, leave the dial command at ATDT. If your phone line has pulse dial for a rotary phone

change this command to ATDP.

NOTE: If you must always switch to an outside line to dial, you can embed the code here as well (for example, ATDT9W; the W after the number causes the modem to wait for another dial tone).

**Setting the Timeout**
Timeout enables you to set the number of seconds that the PowerWatch program will wait to connect with the remote station before hanging up.

Leave the default setting at forty-five seconds unless you are placing an international call, in which case you may need to choose a longer timeout.

Next step:
Dialing a remote site

---

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**5.3.9 Remote modem connection**

# Remote modem connection

Before you install the remote modem at the remote station, you want to be sure that you are able to communicate with it. To save yourself time and trouble, we suggest that you set up your computer station and your remote station close to each other on different phone lines (preferably in the same building) to test their operation.

**Connecting the Remote Modem**
The remote station consists of a PowerWatch VDR, an LIC-100 Lite-Link interface cable, a 9- to 25-pin adapter, an MA-100, and a modem.

1. Connect the LIC-100 Lite-Link interface cable to the 9- to 25-pin adapter.
2. Connect the 9- to 25-pin adapter to the MA-100.
3. Connect the MA-100 to the modem.
4. Connect the modem to a phone jack.
5. Plug the wand into the VDR's optical port.

When you have connected all equipment and set up both modems, you are ready to dial the remote site.

Next step:
Dialing the remote site

---

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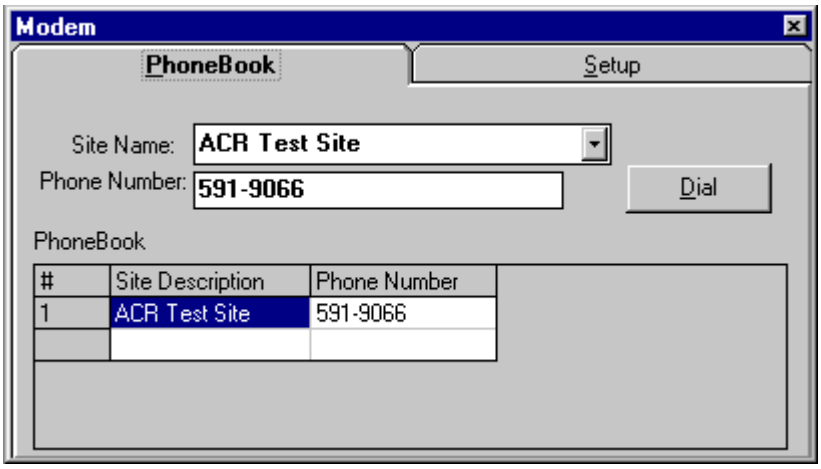
## 5.3.10 PhoneBook

# PhoneBook (saving phone numbers & dialing a remote site)

The PhoneBook function enables you to save phone numbers and to dial a remote site. The PhoneBook is opened from the Edit menu.

**Saving Phone Numbers**
To open the PhoneBook, either *No COM Port* must be selected or the active COM port must be connected to a modem.




When you have entered the remote site name and phone number, save them by choosing **Save** from the **File** menu.

**Dialing a Remote Site**
1. From the Communicate menu choose the COM port that is connected to the computer station modem to open the Modem dialog box.

2. Select the phone number from the pulldown list and click the **Dial** button.

See also;
Modem overview

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# SECTION 6 Troubleshooting

## Overview

- **Lite-Link Interface Cable**
- **Printers**
- **Voltage Disturbance Recorder**
- **Technical Support**

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## 6.1 Lite-Link Interface Cable

# Lite-Link Interface Cable

Many manufacturers of PC software and hardware use serial (COM) port(s). It is difficult to predict potential serial port conflicts. If the Lite-Link interface cavle's wand tip is not flashing, ther are a few steps that can be taken in order to potentially find the source of the problem.

- **Make sure that the Lite-Link interface cable is securely plugged in.** The Lite-Link may appear to be properly connected but only be partially plugged in.

- **Try a different serial port.** If the PC has more than one serial port, try another port to see if the Lite-Linnk flashes.

- **Determine if you have any other Windows programs using the serial port.** PC faxing programs or other programs that use the COM port can cause conflicts during data transmission. To verify that no other programs are running and causing comunication problems, shut down your computer and restart if before you run the PowerWatch program.

- **Verify that your serial port settings are correct.** In Windows 3.1, use the Microsoft Diagnostics program, MSD.EXE, to find out the number of installed serial ports in you PC, and their settings. These settings should be the same as those displayed in the advanced section of "Ports" in the Windows 3.1 Control Panel. Exit Windows or restart the computer in MS-DOS mode before running MSD. If an internal modem is used, MSD may detect the modem's serial port. This serial port cannot be directly used with the Lite-Link.

Windows 95 users can verify port settings using Device Manager. Device Manager is found on the Task Bar by choosing **Start, Settings, Control Panel, Systems,** and **Device Manager.**

**Standard COM port settings**

| Port | I/O Address | IRQ |
|---|---|---|
| COM1 | 3F8h | 4 |
| COM2 | 2F8h | 3 |
| COM3 | 3E8h | 4 |
| COM4 | 2E8h | 3 |

- **Verify that your serial port is functioning properly.** Use any standard Windows communications program to ensure the port is functioning. Examples include: *ProComm*, Windows 3.1 *Terminal* or Windows 95 *Hyperterminal.*

Exit all programs (including PowerWatch) and connect the Lite-Link to the

port. Run the communications software and set the local echo to "off" and hardware flow control control to "none". When using Hyperterminal, choose a direct connection to the port. Open the port with the communication software. Any alphanumeric character typed on the keyboard should cause the Lite-Link to flash, and the character to appear on the screen.

If the Lite-Link does not flash during typing, the Lite-Link may need repair.

If the Lite-Link flashes during typing, it should also work with PowerWatch software. Exit the communications program, and re-start PowerWatch. If Lite-Link does not flash when running PowerWatch, re-install PowerWatch software.

- **Check your mouse driver.** Certain older or inferior drivers for mice, trackballs, and laptop "pointers" are known to interfere with serial port operation. If, after disabling your mouse driver, the Lite-Link functions normally, try using a high quality mouse driver such as Logitech or Microsoft.

- **Try another computer.** An alternative to serial port troubleshooting is to use a different computer. Another computer with its serial ports set up correctly will confirm that there is an incorrect set up or software/hardware conflict with the original PC.

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## 6.2 Printers

# Printers

- Verify that the printer is plugged in, turned on, and has paper.
- Verify that Windows is set up correctly. Windows uses its own printer drivers. Set up is done through the Windows Control Panel. If you need help, follow the instructions in the Windows 3.1 Guide under **Printers/Setup**; in Windows 95, click **Help**, and choose **Troubleshooting Printers.**
- Try printing from another program to eliminate the possibility of a hardware conflict.

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## 6.3 Voltage Disturbance Recorder

# Voltage Disturbance Recorder

- **PowerWatch voltage readings can be different on various meters.** A PowerWatch VDR reads voltage in average RMS, while some manufacturers' meters may calculate and display True RMS.
- **Date and/or time are not correct.** The PowerWatch uses the PC's internal clock to reference the time of the downloaded data. Set the PC's internal clock to the current time. The Windows 3.1 User's Guide, under System Time and Date, will explain this procedure; in Windows 95 click Help, time, and changing your computer's time. Make sure that the time format is either 24-hour or AM/PM, not both.
- **PowerWatch time stamps are invalid after a prolonged period of time.** To eliminate this issue, ensure that the PowerWatch VDR is cleared of data a minimum of once every four years.
- **Two PowerWatchs have different impulse readings on the same circuit.** Locally generated impulses can carry relatively little power. One VDR can absorb some of the energy leaving less for the next one in the series to read.
- **PowerWatch records long periods of large NG surge.** The VDR has been plugged into a convenience outlet that has been wired with the hot and neutral lines reversed.
- **PowerWatch does not record any data.** The VDR does not record events while communicating. Make sure that realtime display is stopped. PowerWatch will record events in 8 to 16 seconds thereafter.

---

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## 6.4 Technical Support

# Technical Support

If you are experiencing problems with your PowerWatch system, please contact:

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Unit 210-12960 84th Ave.
Surrey, B.C. V3W 1K7 Canada

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Fax: (604) 591-2252
Toll Free Canada & U.S.: 1-800-663-7845

Website: www.acrsystems.com
E-mail: customerservice@acrsystems.com

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